ARCHITECTURE DEPARTMENT **CHINESE UNIVERSITY OF HONG KONG**

MASTER OF ARCHITECTURE PROGRAMME 1997-98 DESIGN REPORT

SYNOPSIS EXPERIENCE THE CELESTIAL IN NATURE ... ENHANCED BY TECHNOLOGY & ARTIFACTS

NG Yat Chiu Patrick April 1998

you have seen the night of hong kong

have you seen the light of the sky

experience the nature

SYNOPSIS

experience the celestial in nature

. . . enhanced by technology & artifacts

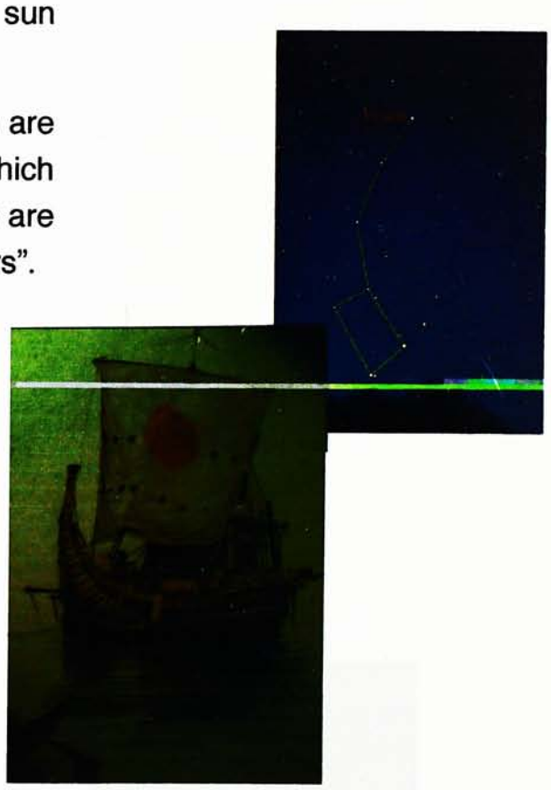
While most people are concerned with the direction of future urban development in Hong Kong, some public facilities relieving man from this hustle and bustle of urban life should also be considered.

Astronomical observation has a long history and close everyday relationship with human. Time, date, seasons are all derived from the celestial movements and activities. Myths relating to the special celestial events had been developed in different regions of the world. Early navigation was also made possible only by references to the location of sun during day time and stars at night.

Partial lunar eclipse

However, what the advance man now is interested in are more the vibrating crystal or the ever moving arms which guide our endless repetition of "**LIFE**". Urban dwellers are attracted by the city "milky way" and the "sparkling stars".

To look into the issues, facilities currently available in Hong Kong allowing people to be in contact with nature are insufficient. Adding to the always overcast and polluted sky, the densely congested urban living environment has restricted people from direct sky watching in the neighbourhood in Hong Kong whereas it is possible in many other cities. The Space Museum under Urban Council may be some sort of "compensation", but the artificial simulation is only significant in low level education, while fails to bring human right into nature and enhance the relationship between the two.



'The Southern Cross I saw every night abeam. The sun every morning camp up astern; every evening it went down ahead. I wished for no other-compass to guide me, for these were true.'

Captain Joshua Slocum
SAILING ALONE AROUND THE WORLD

Given the situation, a venue enabling human restoring relationship with celestial and nature has to be developed. It should be a place for both general public and amateur astronomers. It is to raise the public interest in our mother planet and other mysterious celestial bodies and to provide those interested in star gazing with a more appropriate observing place.

'You have seen the night of Hong Kong, have you seen the light of the sky?'

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BACKGROUND OF HK - EXISTING STATE

Economy and Life

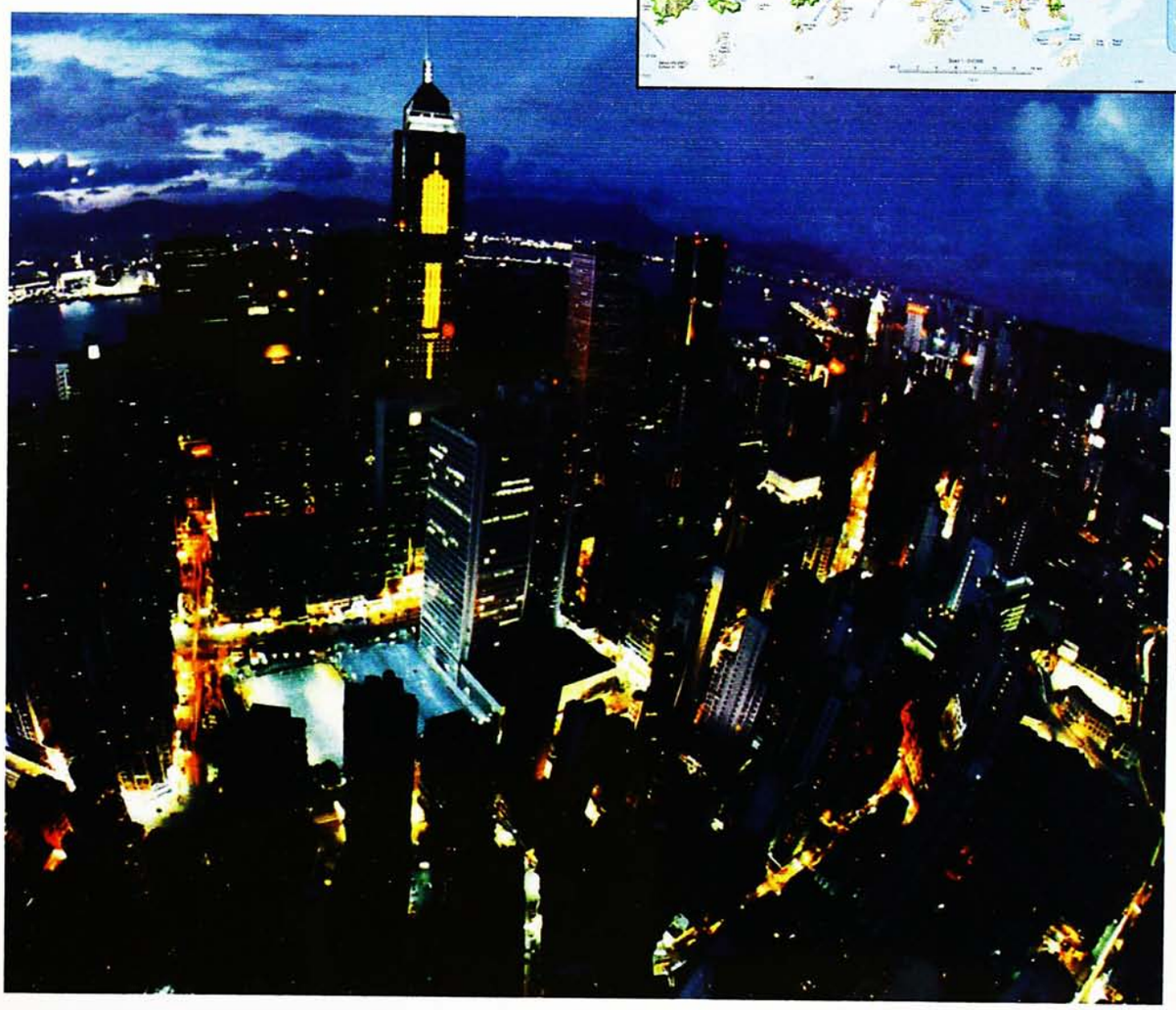
As Hong Kong functions as a commercial trading gateway to China, it has experienced a rapid and drastic growth of economy along with sharp increase in population.

The fast growing economy and keen competition lead to an extremely fast pace city life in Hong Kong. And dense concentration of developments limited by the hilly terrain, is linked by heavily loaded transportation systems. Growing up in this environment, the majority people of this city of vertical concrete towers have been accustomed to limited living and working spaces, in trying to share the prosperity of this bustle and hustle

----- **"Pearl of the Orient"**.

below
map of Hong Kong

bottom
High dense vertical development in Wanchai



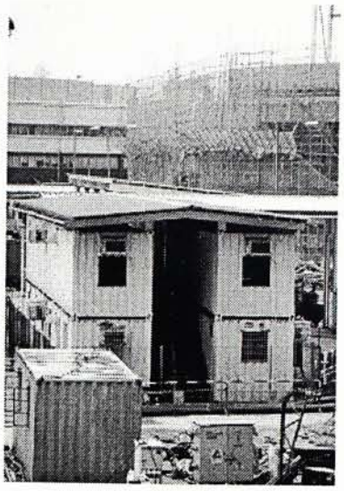
BACKGROUND OF HK - EXISTING STATE (cont'd)

Architecture and Function

The hot and humid summer and the congested living environment demand that architecture, as a physical tool, provides such "qualities" as climatic comfort and privacy. Architecture, as a result, evolves as mere shelter and mere dwelling in the territory.

In this situation, the major difference between the high quality developments and the lower quality developments is the superficial and cosmetic different dress they wear. Urban development alienates man from nature.

Architecture, separates man from **environment**; **City**, separates man from **nature**.



Pure functional "shelters" from plugging containers.

Recreation and Nature

To relieve the high stress and the fast pace of urbanization, and to **arouse the public awareness on the natural environment**, provision of recreational, together with cultural, art and sport, facilities are increasingly promoted by both the government and voluntary associations.

The Urban Council (currently the Provisional Urban Council) and the Regional Council (currently the Provisional Regional Council) are the two major related government bodies. Each of them is responsible for 9 districts serving more than 3 million people. Their missions are to provide venues for recreation and sports and to arrange associated activities and programmes.

below

Built on a site of 87 hectares in the island, Ocean Park is South East Asia's largest oceanarium and Hong Kong's premier entertainment park. It includes various amusement facilities, a Chinese cultural village and Asia's largest aquaria.

The facilities provided by the Councils include public open space, preserved natural green area, aviaries, soccer pitches, jogging tracks, indoor games halls, museums, indoor and outdoor stadia.

However, an environment that can enhance relinking man to celestial and nature is still lacking.

BACKGROUND OF ASTRONOMY - EXISTING STATE

Ancient Astronomy and Man

Astronomy is the study of the nature and movement of heavenly objects in the Universe: planets, moons, comets, asteroids, stars, and galaxies.[1]

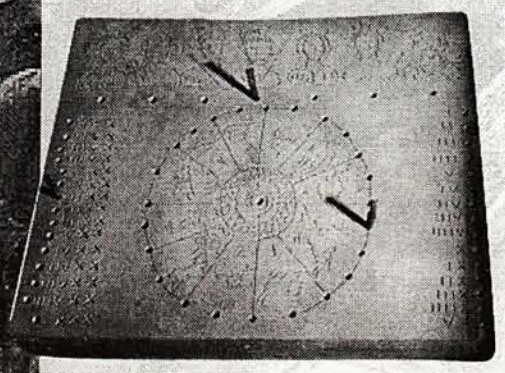
In ancient time, skywatchers saw the heavens in religious terms. The sky was the home of the gods as they controlled day and night, storms, and the great eclipses of the Sun and Moon. In addition, in different culture, the celestial phenomena were thought to influence people's everyday lives and personalities and developed into different well-known myths.

The priests-astronomers, studied the sky, kept records, compiled calendars, and acted as custodians of legends relating to the sky. There was no clear distinction between astronomy and astrology.

Akkadians in 2500 B.C., in the northern part of Babylone was believed to be the first people to have kept astronomical records. From their observations and records of the Sun, the Moon and the planets, the later Babylonian astronomer-priests could predict the courses of wandering objects in the sky.

Calendars and **timing devices** were then invented with motion of the celestial objects. 7 days a week, to match each quarter phase of the Moon, and the 12 months of a year reflect the Moon's completion of its cycle of phases 12 times a year. People planted and harvested their crops according to the records and the Egyptians predicted when the river Nile's annual flood would irrigate their fields.

Early sailors in **navigation** used the positions of the stars to guide them when they are our of sight of land. The Polynesians, for example, learned the positions of the stars and the prevailing wind patterns through poetry that they learnt by heart, passed down from generation to generation.



bottom left

The Roman Calendar, *with 7 day week and 12 months, each of around 30 days. Days, weeks and months can be counted off using the holes in the stone block.*

below

Stonehenge, *one of Europe's most striking megalithic monuments in southwestern England. Initial building has been dated at about 1800 BC, and today's stone circles were constructed in several stages over the following 400 years. It is aligned to receive the rays of the mid-summer sunrise, and may have been used to predict the motions of the Sun and the Moon, including their eclipses.*

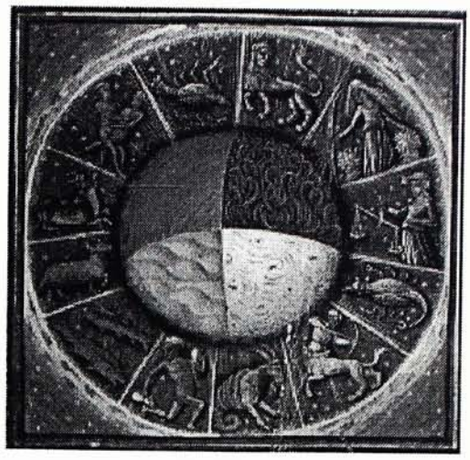
[1] *as defined in the Visual Encyclopedia, Dorling Kindersley Limited, New York.*

BACKGROUND OF ASTRONOMY - EXISTING STATE

Constellations

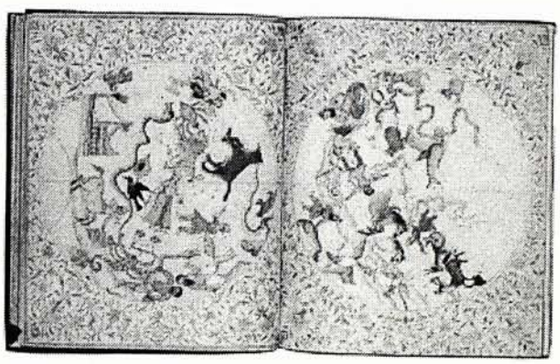
"From the dawn of time, skywatchers have projected images of their own invention onto the stars, filling the heavens with gods, animals and fantastic creatures." [1]

People have long grouped stars into constellations, turning the imaginery outlines into figures and animals relating to local customs and creating elaborate stories around them. Some of them were thought of as deities while some were seen as more down to earth, such as the Big Dipper or the Plough. Some star groupings are so striking that there are myths associated with them throughout the world.



Zodiacal Signs, *ring of the world, which is composed of four basic elements-earth, air, fire and water. Dated from 15th century*

The Zodiac is the belt of 12 constellations that span across the sky. It is also the apparent path of the Sun, the Moon and the bright planets. These zodiacal signs are the most ancient of the 88 constellations recognized today and they also act as markers in astrology.



Indian Star Chart, *a beautiful rendition of the constellations, featuring ancient Indian and Islamic patterns, accompanied a horoscope commissioned by an Indian monarch for his son in 1840*

Cosmology

Throughout the history of man, people are developing different models of the universe, or the relationship between heaven and earth, from **geocentric** to **heliocentric**, and trying to trace the origin of our universe. These studies took the form of philosophical thinking in the past to the scientific studies at present. And these reveal more and more about what previously are myths.

~600BC *Thales of Miletus believed the universe is **rational**, understandable by humans*

~500BC *Pythagoras stated it should be a **geometrical, mathematical** (musical) universe*

~400BC *Plato thought the heavens were in **uniform circular** motion*

~300BC *Aristotle developed a geocentric model of the universe with 56 spheres **rotating around the earth***

~200BC *Hipparchus raised the model of **earth near**, but not at **the center of circles** while planets move in small circles that followed a larger circle around the earth*

~100AD *Ptolemaeus developed a sophisticated mathematical model with epicycles around deferent, and the **earth is off center of the deferent***

~1500 *Copernicus revolution to the heliocentric model: the sun is at the center of the universe **(heliocentric)***

~1930 *Formation of our universe: **Big Bang theory***

[1] *quoted from David H. Levy, Skywatching Through the Ages, Skywatching, the Nature Company, San Francisco*

BACKGROUND OF ASTRONOMY - EXISTING STATE

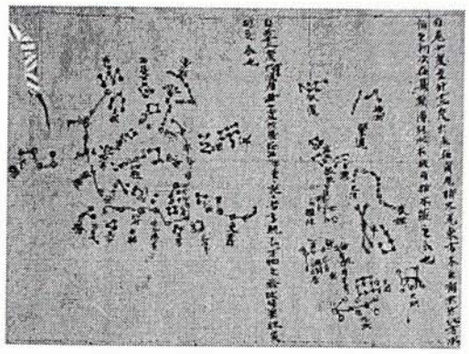
Astronomy in China

The **Chinese** have a long history of dedicated sky observation, there is evidence that our ancestors recorded a close grouping of the bright planets in about 2500BC.

Being an early civilized country and regarding crop raising as the major activities, China realised that the knowledge of the seasonal changes are very important. The Chinese are believed to be the **earliest calendar makers** with a calendar that dates back to 1300BC.

In the fourth century BC, they also produced the earliest known atlas of comets, the **Book of Silk**. It is a silk ribbon about 1.5 m long discovered in a tomb in 1973. The book illustrates 29 forms of comets and lists the various types of catastrophes they heralded.

During the **Han Dynasty**, **Cheung Hun** (78 - 139AD) made a great contribution to the astronomical development in China. He broke through the traditional thinking of earth being a plate floating on water with the sky surrounding it like an umbrella. He thought the heaven was just like an egg while earth was the yoke floating in "*air*". He also successfully invented several significant instruments which pushed the astronomical technology a large step forward.



above

Chinese Star Map, *from Tunhuang, China, around 940AD. The oldest known portable star map.*

top

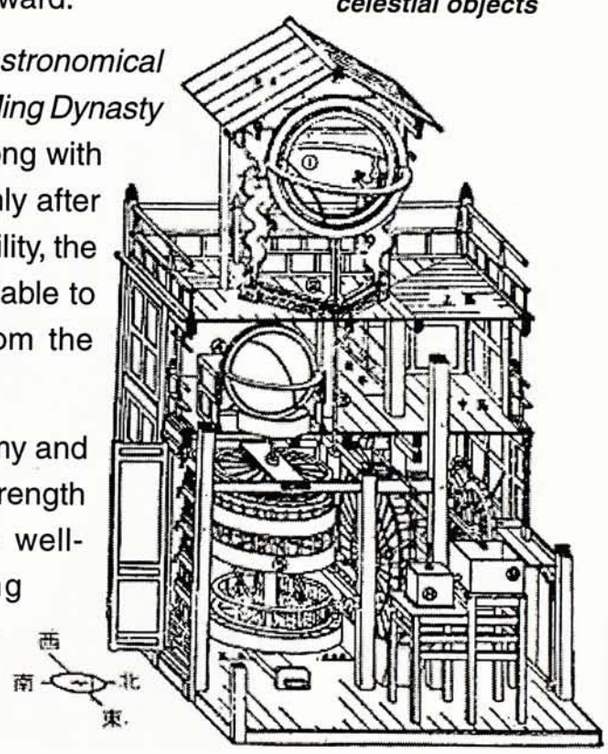
Instrument for detecting earthquake

below

Water powered instrument simulating the motion of celestial objects

The Chinese had the *most advanced astronomical achievement in the world until the end of Ming Dynasty* when the western capitalism evolved along with the technological rapid improvement. Only after the Communist settled the internal instability, the astronomical development in China was able to continue to grow under the support from the government.

At present, the achievements in astronomy and space science somehow represent the strength of a country. As a result, most of the well-developed countries place a strong emphasis on the development in these aspects.



BACKGROUND OF ASTRONOMY - EXISTING STATE

Astronomy and Amateur

Unlike other disciplines in the field of science, astronomer amateurs have made contributions comparable to those by professionals.

Despite most of the discoveries in astronomy today are made by professional astronomers who work with medium to large telescopes, amateurs play a valuable part in modern astronomy through their **continuous monitoring** and **broad sky coverage** that professionals cannot afford.

In reality, many comets, novae and supernovae were discovered by amateurs who dedicated enormous amount of **time** and **experience** to careful, systematic observations of the sky.

Leslie Peltier, for example, was originally an Ohio farm boy. Because of his curiosity of the sparkling stars one night in 1915, he started his observing activity for the rest of his life. He then built up his reputation in observing variable stars and discovered 10 comets that were named after him.

Because of the enjoyable nature and the challenge of finding new objects or phenomena, which may bear the founder's name, **public sky watching** is very common and popular in other well developed countries such as Japan and United States. A municipal government in Japan even develops a whole set of regulations to control the city light at night so as not to minimize effect of sky watching.

To draw a conclusion, **promoting public sky watching is as valuable as developing formal observatory.**

An astronomer amateur looking at the sky with his portable telescope

Comet Hale-Bopp

The comet was discovered by two American astronomer amateurs in July 1995. When the comet pass through the earth in 1997, it had the apparent magnitude of -1.7, which was the brightest comet in the century. Because of its brightness, many astronomer professionals and amateurs were jubilant about this and many related observing activities were held.

ASTRONOMY IN HONG KONG - EXISTING STATE

Facilities provided by the Government

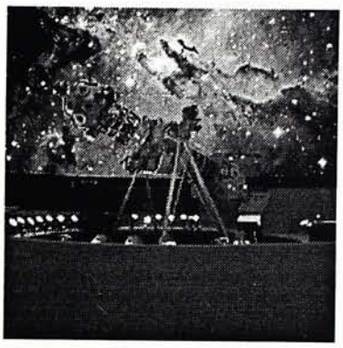
The Hong Kong Government has its own observatories under the Royal Observatory for weather predictions and some celestial studies. Unlike most other **port-orientated** cities in the world where studies of the relation between celestial bodies and **tidal** changes are important, such as Liverpool, Hong Kong has no formal astronomy base. It is due to the unfavourable climatic conditions, polluted, moist and overcast sky reflecting city lights.

Hong Kong Space Museum under the Provisional Urban Council is the only government public facility that provides astronomy education to the public. However, being located in the city center, the Museum provides a fully controlled, weather proof **man made environment** for the public with the provision of artifical exhibits, lectures and projections. People interested in star gazing can only join the Museum's monthly constellation observing lectures inside an artificial virtual environment.

General public interested in naked eye observation have to find other sources of facilities that are suitable for this purpose. Even sky gazing camps organised by university astronomy class have difficulties in selecting suitable venues. Usually remote **youth hostels** without any appropriate facilities will be the venue. This means the class has to transport their own telescopes or relevant instruments to these areas every time.

In terms of private organisations, the **Ho Koon Nature Education cum Astronomical Centre** run by **Sik Sik Yuen** and the **Bradbury Camp** run by **the Boys' and Girls' Clubs Association of Hong Kong** both have dedicated facilities for celestial observation. However, they are not intended for the general public use or overnight star gazing activities.

Despite the problems of public access to astronomical facilities, there are four major public astronomical associations and thousands of academic interest groups in Hong Kong.



above

Planetarium projector inside Space Theatre in HK Space Museum which can accurately projects different constellations in different seasons at any year.

below

Computer controlled 20 inch diameter astronomical telescope in Ho Koon Nature Education cum Astronomical Centre.

The four major local public astronomical associations:

1. ***Hong Kong Astronomical Society***
2. ***Sky Observers' Association***
3. ***Space Observers HK***
4. ***Astronomy Workshop***

CLIENT PROFILE - EXISTING STATE

Client Group

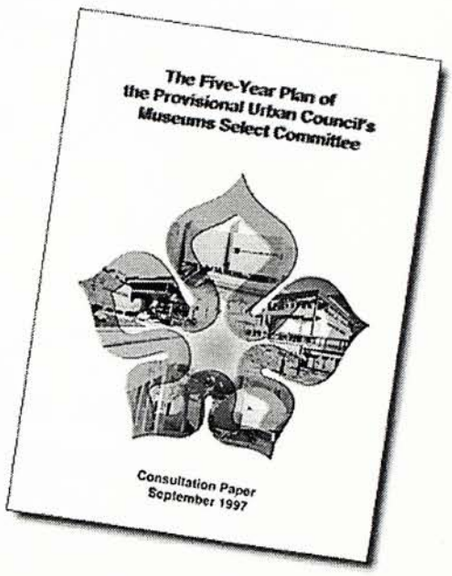
Within the Five-Year Plan of the **Provisional Urban Council**, the Museums Select Committee carries out an in-depth analysis of the services provided by the Council's museums. As a result of this extensive study, a set of comprehensive policies on future museum services is formulated.

Besides the proposals of renewing exhibits of the Space Museum, exhibitions on topics of current interest, setting up of a resource centre and upgrading of Space Theatre equipment, development of **outreach activities** is also stressed in the proposed **Five-year Strategy**. Establishing a mobile observatory and a **permanent public observatory** policy framework are the nucleus of this.

Because of the difficulty in choosing a suitable site for this permanent public observatory in the nine urban districts, the Committee conducts a discussion with the **Provisional Regional Council** and an astronomical association, **Sky Observers' Association (Hong Kong)** on the issues.

Being a charity organization enthusiastically promoting education, environmental and recreational facilities to the public, the **Hong Kong Jockey Club (Charities) Limited** grants a funding to the development of this public observatory.

As a result, the **client group** include the **Provisional Urban Council** and **Provisional Regional Council** serving as the real implementing body with financial support from the **Hong Kong Jockey Club (Charities) Limited**. Consultation and the running management of the facility will be carried out by **Sky Observers' Association (Hong Kong)**.

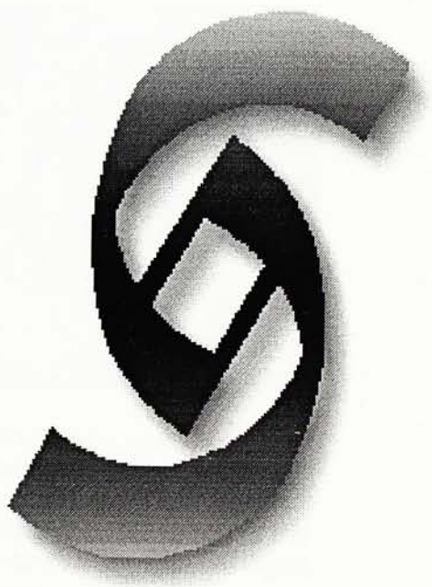


above

The Five-Year Plan of the Provisional Urban Council's Museums Select Committee, *Consultation Paper September 1997*

below

Logo of Sky Observers' Association



USERS GROUP - PROPOSED

This observatory development is a public facility instead of a specialised scientific research centre. In this case, the client is different from the real users.

Besides the staffs running the facilities, major end users of this facility are the **general public**, especially those with affection for nature. The role of this development is to promote their interest in natural environment and arouse their awareness of environmental concerns.

Majority of the users will be people with interest in astronomical observation. These include students from secondary school **astronomical societies** and university **students studying astronomy**. They usually organise one to four star gazing camps annually. There is a Bradbury camp operated by the Boys' and Girls' Clubs Assoication of HK in Sai Kung for the primary and secondary school interest groups. However, the university hobby societies and astronomy class students have the heaviest demand on this kind of facilities. For current situation, these groups can only go to the ordinary youth hostels for their activities.

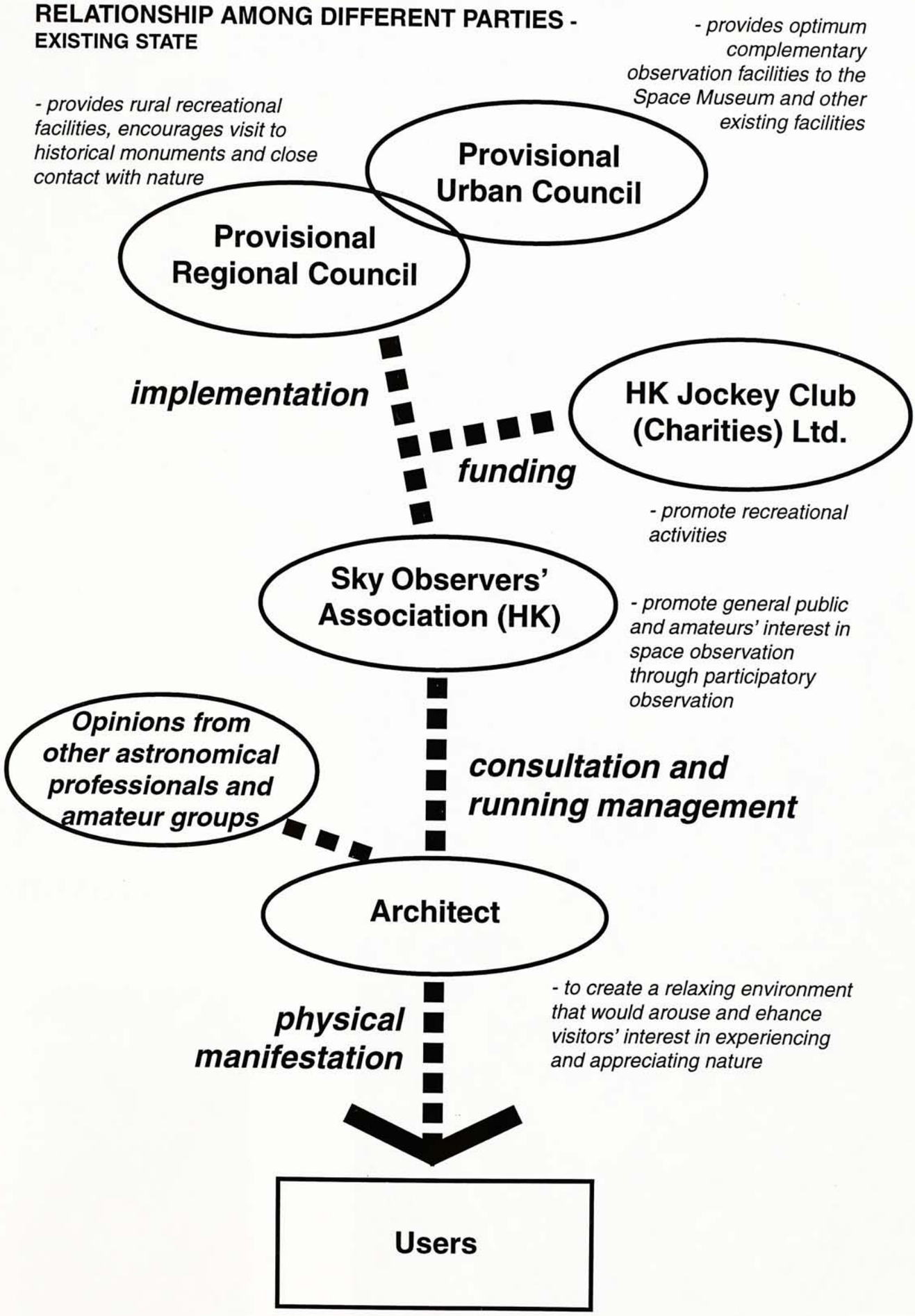
Most frequent users predicted will be the **astronomical amateurs**. They spend most of their leisure time on space observation either at home or at other venues. They have strong enthusiasm in celestial phenomenon. Their contribution to the advance in astronomy worldwide is even stronger than the professional.

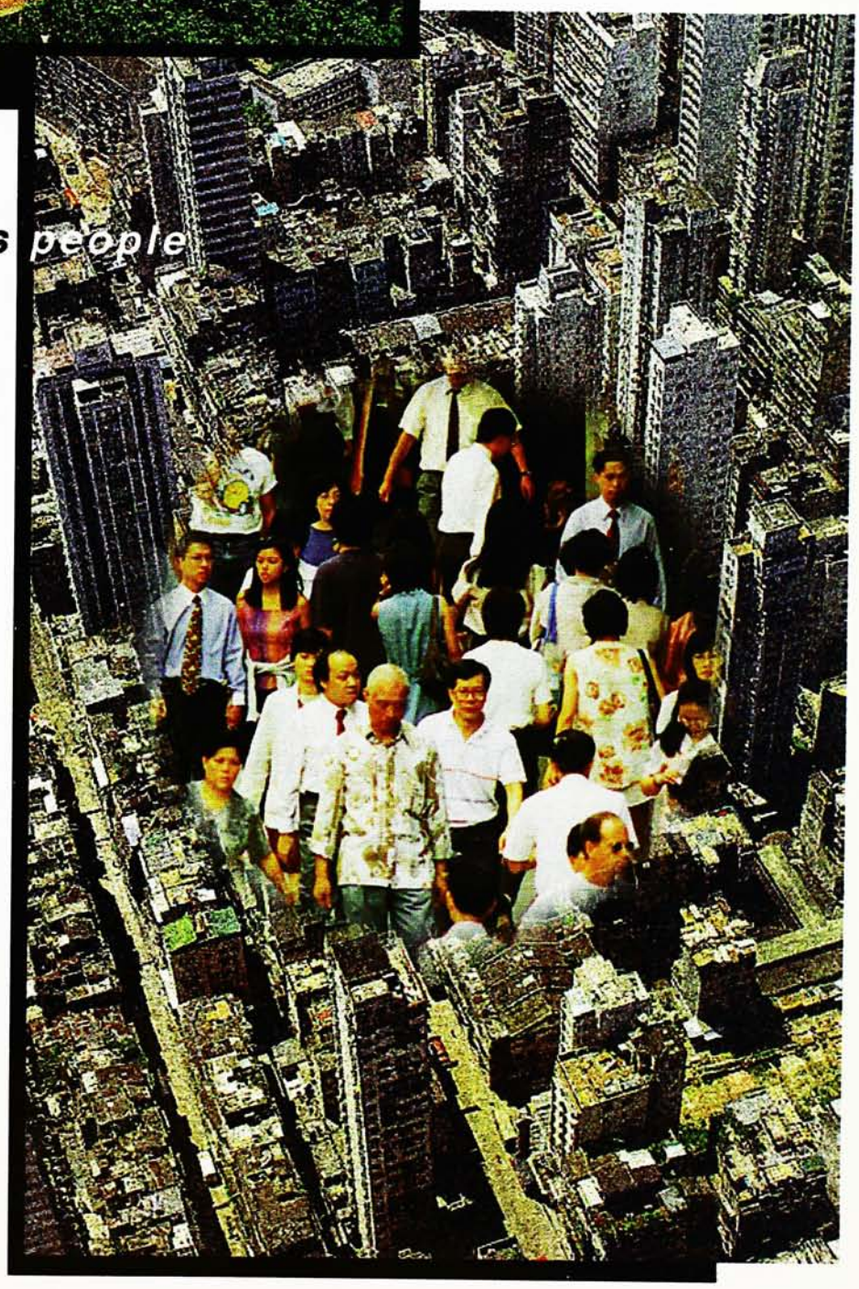
Occasional conferences will be conducted for international professional exchange. These involve **overseas astronomical experts** and **amateurs**.

For these users, day activities in astronomy and space science, including workshops, lectures, exhibits and displays will be provided. Night activities including naked eye star gazing and astronomical telescope observation are also very important. As a result, provision of accommodation and catering facilities have to be considered.

Photo of a group of astronomical amateurs gathering for total lunar eclipse observation at the mid autumn festival night, 1997

RELATIONSHIP AMONG DIFFERENT PARTIES - EXISTING STATE





***building** separates people*
*from **environment***
&
***city** separates man*
*from **nature***

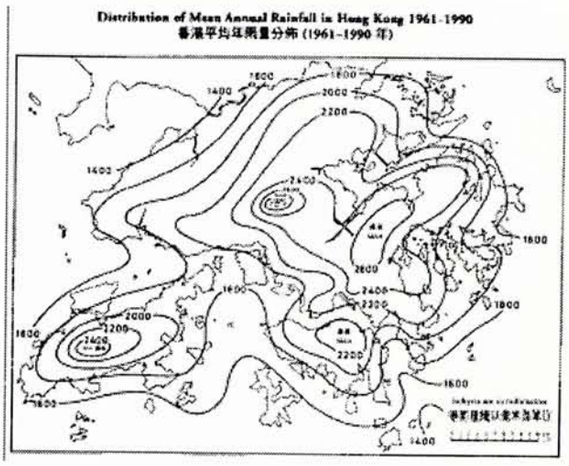
SITE SELECTION - EXISTING STATE

For the activities of naked eye star gazing, an environment with clear sky and minimum light from surroundings should be the fundamental pre-requisite. Serious air pollution and diffused artificial lights in the urban area inevitably limit the visibility to the night sky.

To select a suitable site for this public observatory facility, several major selection criteria were set up :

- *visibility at night*
- *orientation*
- *future development in the neighbourhood*
- *accessibility*
- *closeness to the nature*
- *facilities in the neighbourhood*

To attain an east looking orientation, which is preferred in star gazing, eastern parts of Hong Kong were considered. While major environmentally protected and recreation areas in Sai Kung may best suit this purpose.



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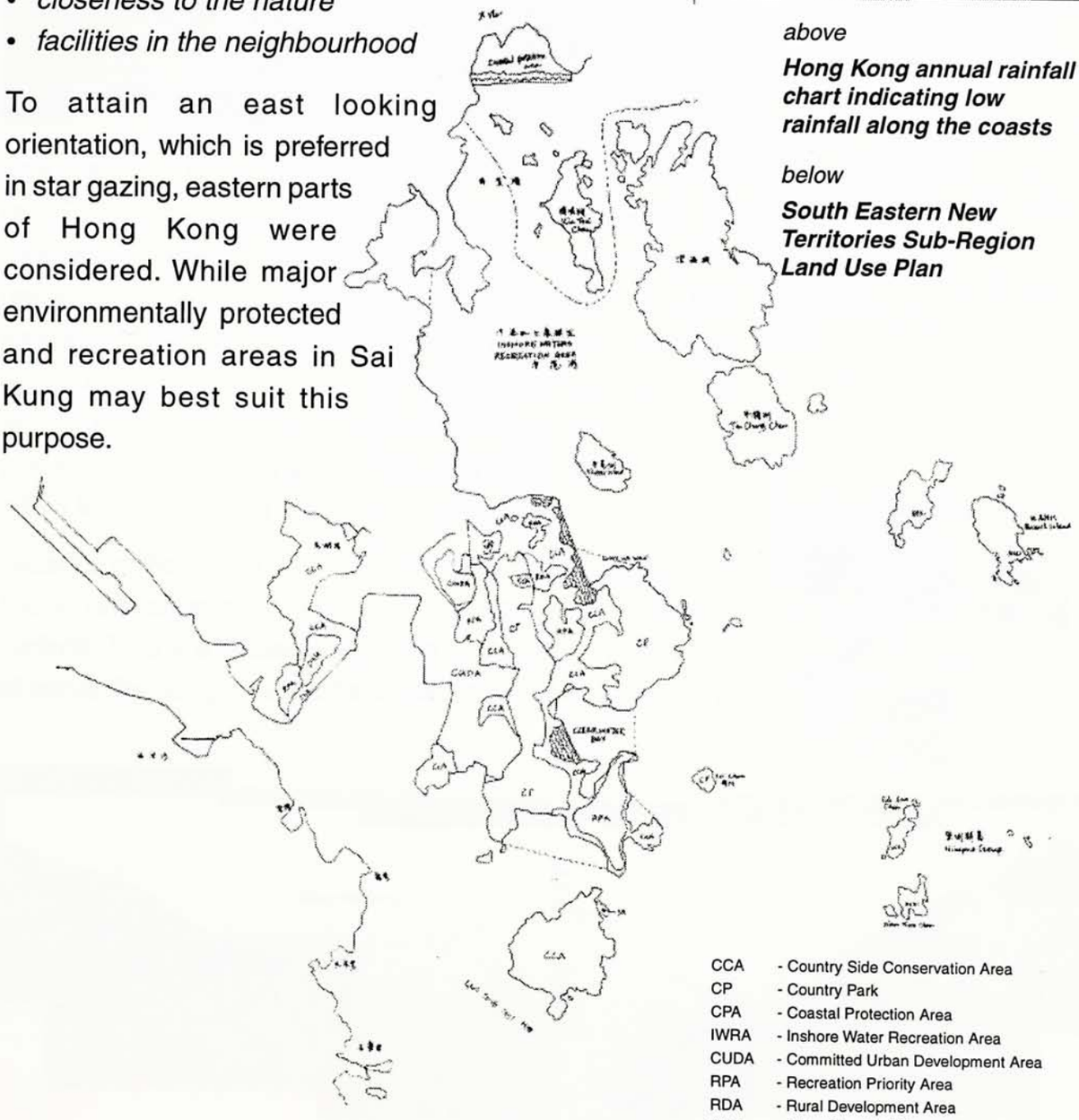
Hong Kong annual rainfall chart indicating low rainfall along the coasts

below

South Eastern New Territories Sub-Region Land Use Plan



SITE ANALYSIS - TUNG LUNG CHAU

left

Location map of Tung Lung Chau

above

Sunrise viewed from the camping site

below

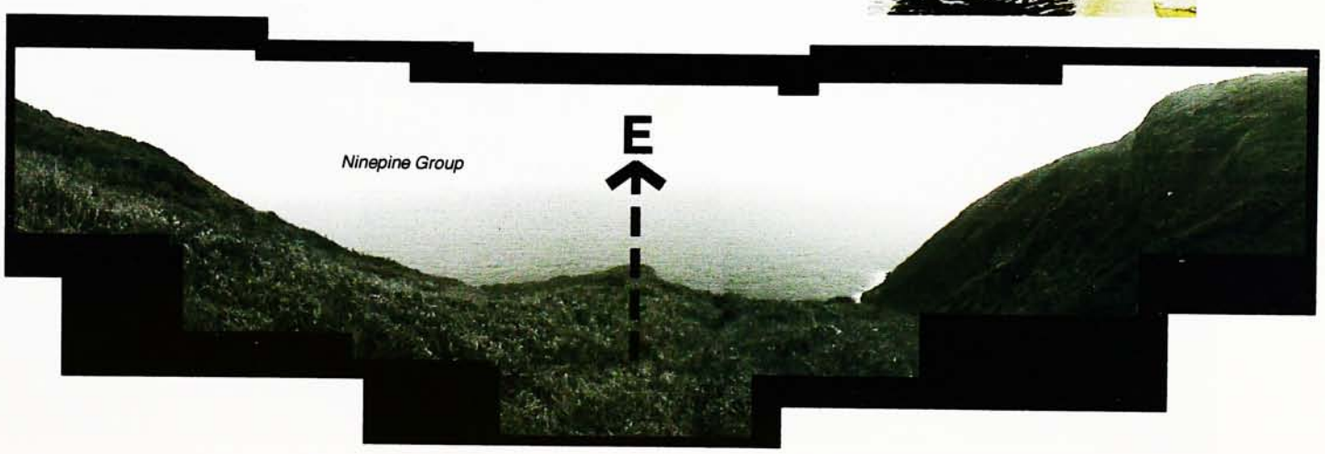
Private owned ferry transporting people to and from Tung Lung Chau

bottom

A unblocked view looking east from Tung Lung Chau

The island of **Tung Lung Chau** (please refer to the location map) is finally chosen as the site for development. Its remoteness from the city centre minimizes impact from the unfavourable city light to ensure better **visibility at night**. Besides, this outlying island is part of Sai Kung, regarded as the Back Garden of HK, where majority of land is zoned as Countryside Conservation Area with minimum air pollution. This also limits **development** that will adversely affect the observation activities in the future.

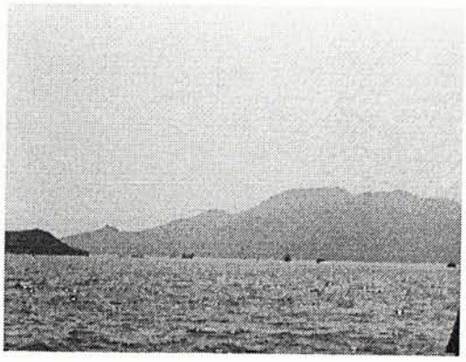
Locating at the eastern mouth of Victoria Harbour, the island has an unobstructed view of more than 180° to the southeast horizon. This is a strategic decision as this **orientation** can observe the rising of celestial bodies throughout the night.

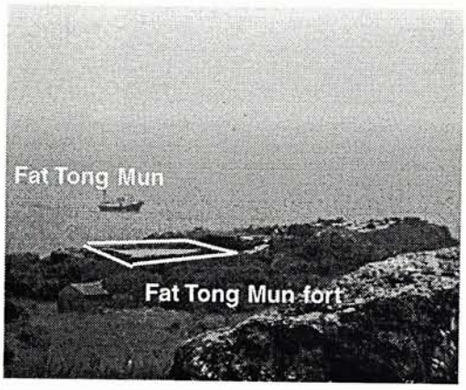


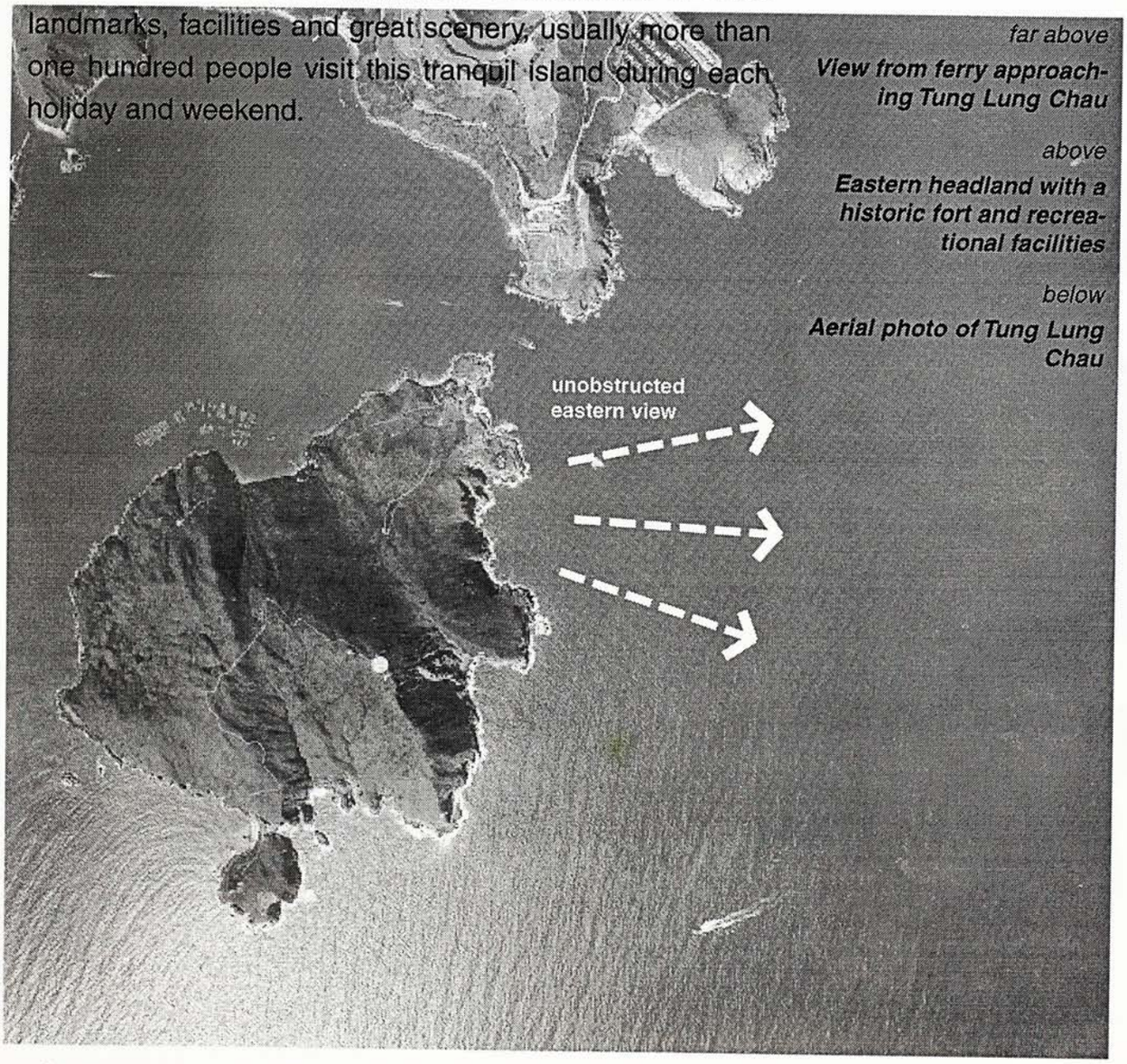
SITE ANALYSIS - TUNG LUNG CHAU (cont'd)

The isolated island currently can be reached by a privately-owned ferry which runs from Sai Wan Ho in a 40 minutes journey. This reasonable **accessibility** with the ferry journey however can help relieving users from tense urban mood to the calm, relaxing life in the nature. The greenish weaving terrain, reddish natural outcrops, steep steep headland cliff with the background music composed by the striking waves on the east and the whistles of breezes amplify the sense of **closeness to the nature**.

There are two existing small villages closed to the piers along the northern coast. Two historic landmarks are also located on the north and eastern side of the island. In addition, **existing facilities** including wild camp and barbecue site are also available near the historic fort. Because of these landmarks, facilities and great scenery, usually more than one hundred people visit this tranquil island during each holiday and weekend.







far above
View from ferry approaching Tung Lung Chau

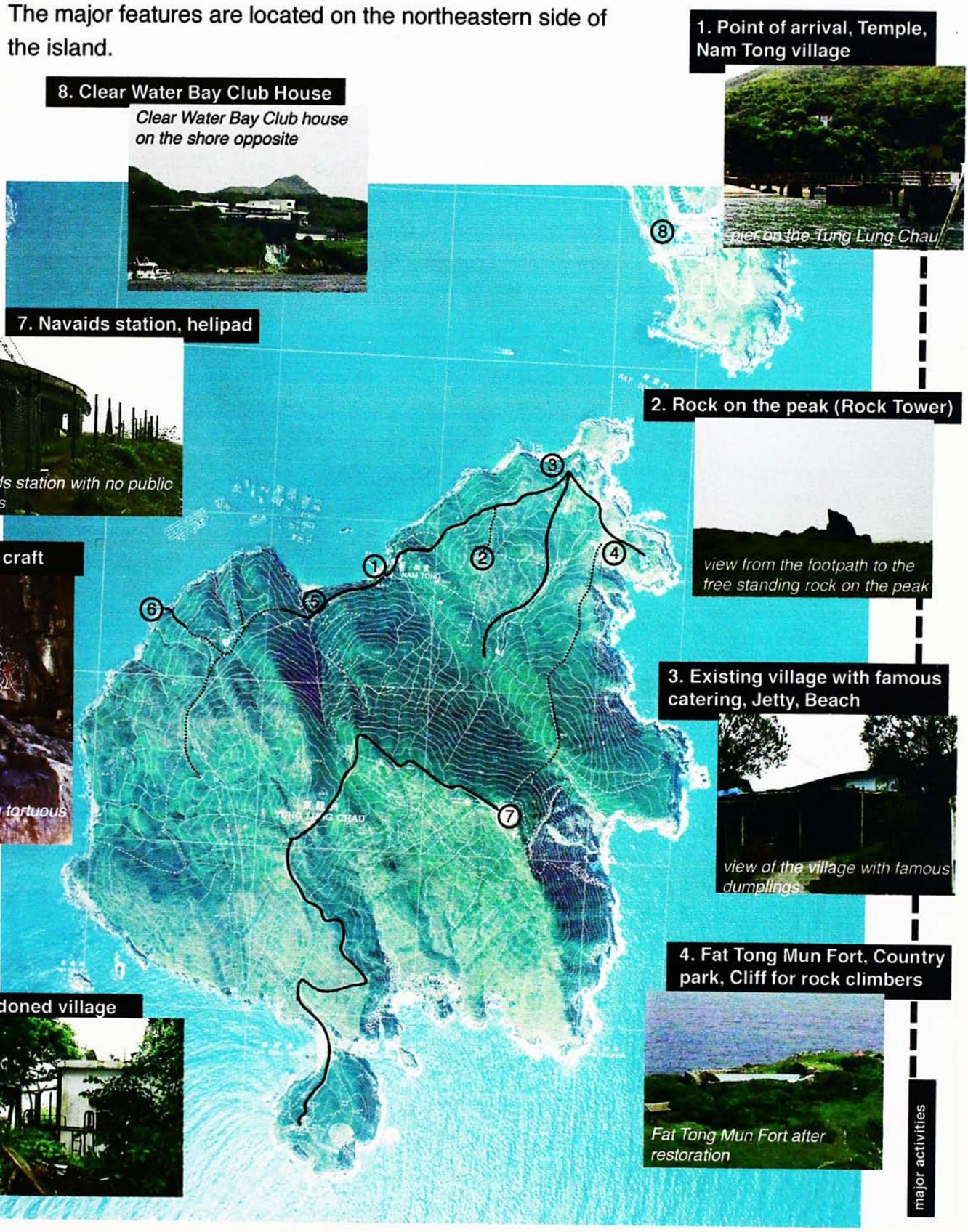
above
Eastern headland with a historic fort and recreational facilities

below
Aerial photo of Tung Lung Chau

SITE ANALYSIS - TUNG LUNG CHAU (cont'd)

Existing Features and Path Conditions

In the existing Tung Lung Chau, there are two declared historical monuments, a country park and several villages. The major features are located on the northeastern side of the island.



SITE ANALYSIS - TUNG LUNG CHAU (cont'd)

Historical Background

The small island of Tung Lung Chau lies near the southern tip of the Clearwater Bay Peninsula. Its strategic location gives this island a special serenity.

Situated at the northern corner of this tranquil island is the historic **Fat Tong Mun fort**, overlooking the Fat Tong Mun passage which connects the sheltered Victoria Harbour to the outside marine on the east. This fort serves as an important strategic point as long ago as Song Dynasty till beginning of the 19th Century. It was finally replaced by a new fort in Kowloon because of the difficulty in keeping the remote island fort supplied and maintained.

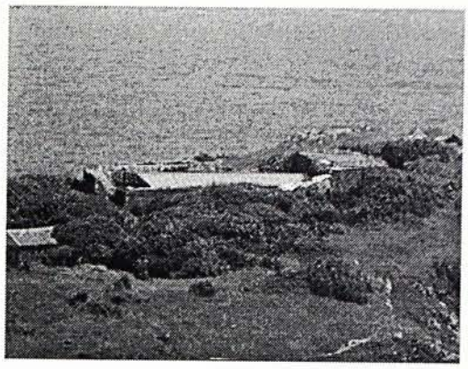
location of historical landmarks

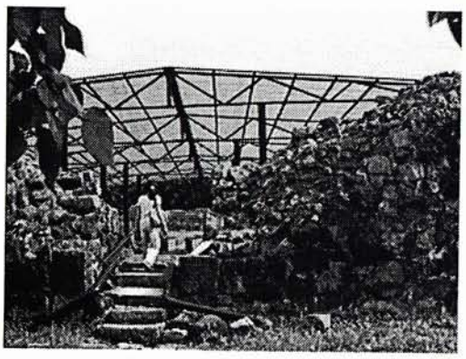
This fort was gazetted as a monument on 25 July, 1980 on the advice of the Antiquities Advisory Board. Restoration of the fort was carried out from 1979 to 1982. The work included repairs, consolidation and partial restoration make the fort a safe and stablized historical ruin.

A striking **rock carving** dated to the distant past is located at the northern coast of Tung Lung Island. As recorded in the Xin-an Gazetteer of 1819 by Wang Chong Xi:

"A dragon impression on rock is found at Fat Tong Mun; the form of a dragon was carved on the rock's vertical surface."

This rock carving measured 180 x 240 cm is currently the largest rock carving known in Hong Kong. It can be clearly seen at a distance with complicated and flowing lines and representing a dragon.





far above

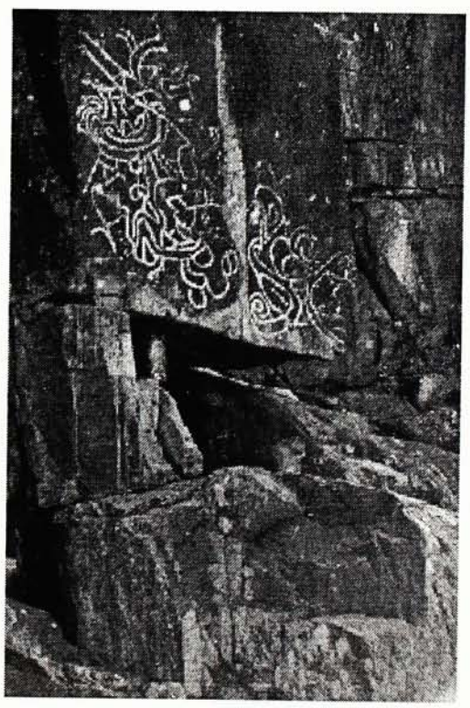
Restored Fat Tong Mun fort with canopy addition

above

entrance to the Fat Tong Mun fort

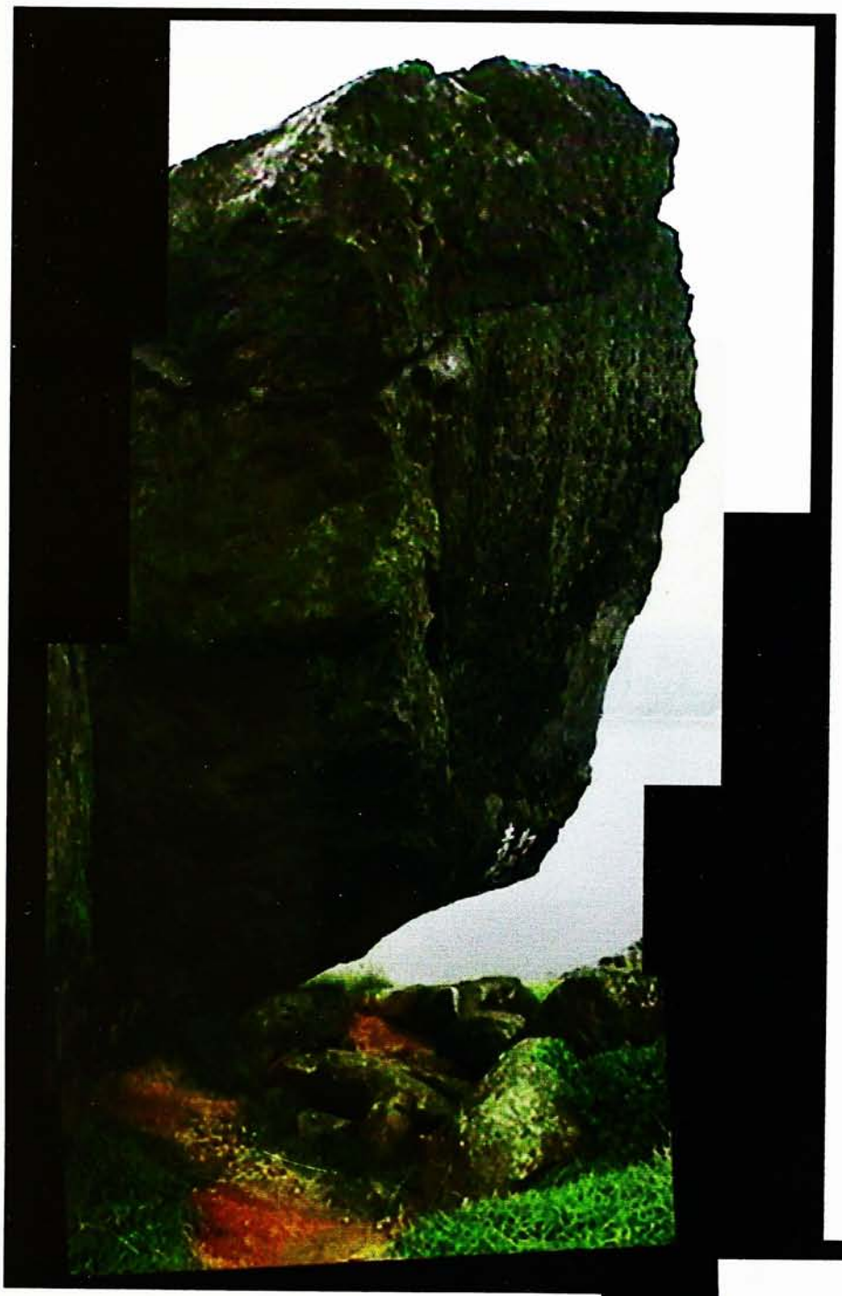
below

Rock carving of 180 x 240 cm area



SITE ANALYSIS - TUNG LUNG CHAU (cont'd)

Rock on the Peak - also known as the "rock tower"



approaching the "rock tower"

left

Close view of the giant rock on the peak, behind it is the Fat Tong Mun

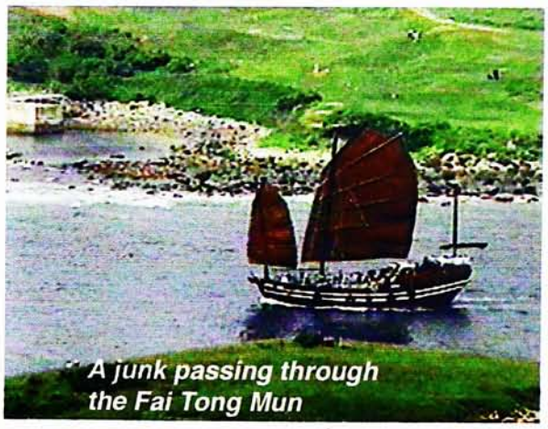
below

View to the "peak of rock" from the north

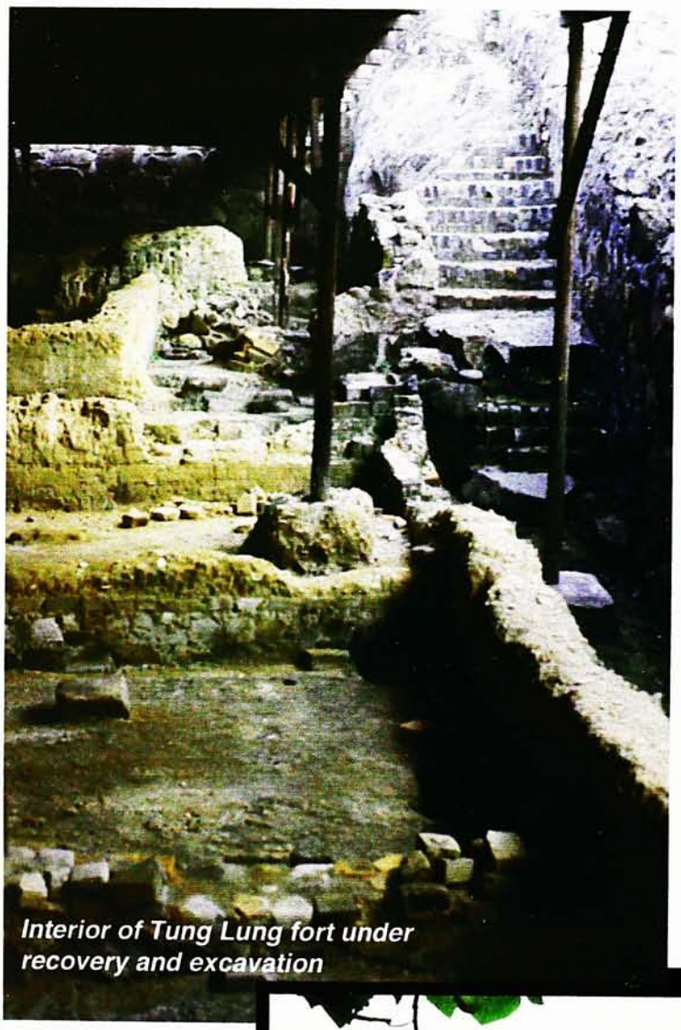
To most traditionally-minded people, these weathered rocks and bolders have some magical powers hidden in them. Especially the huge free standing one, because of its prominence, it always serves as a landmark to the visitors and is known as the "rock tower".

SITE ANALYSIS - TUNG LUNG CHAU (cont'd)

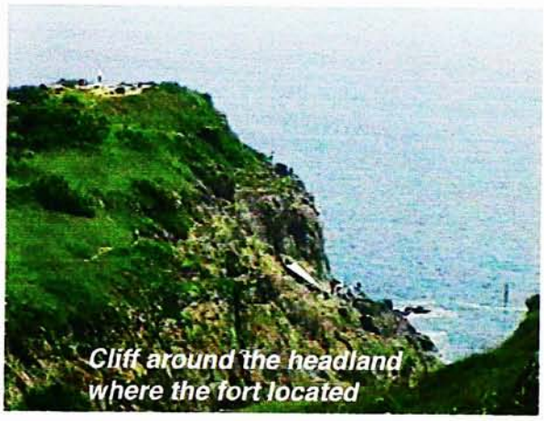
Sceneries of Fat Tong Mun Fort, Country Park and Cliffs with rock climbers



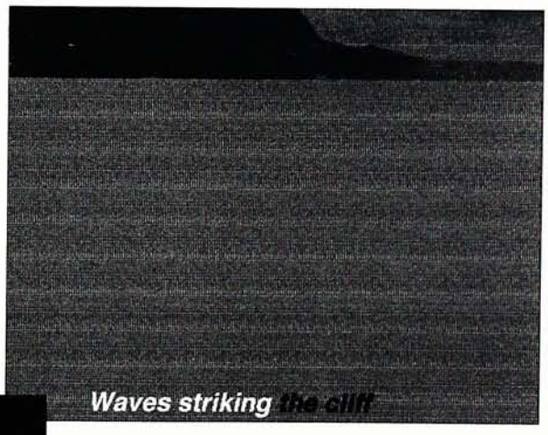
A junk passing through the Fai Tong Mun



Interior of Tung Lung fort under recovery and excavation



Cliff around the headland where the fort located



Waves striking the cliff

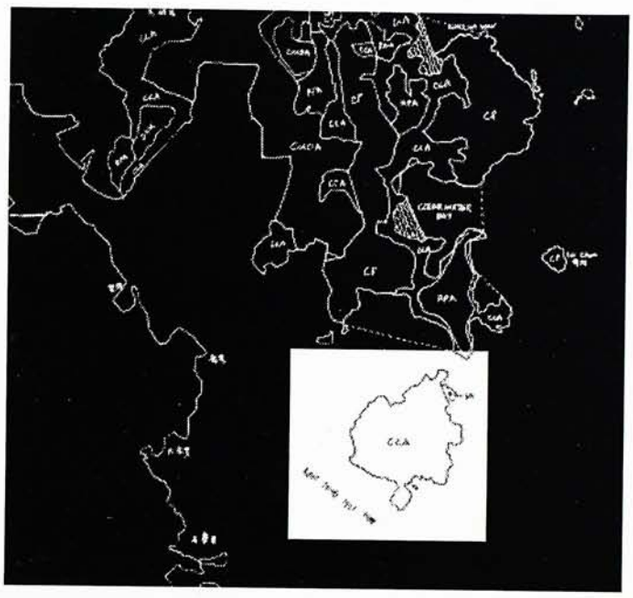
Reconstructed walls of the fort

A small village with some farms closed to the fort

CONSTRAINTS - EXISTING STATE

Outline Zoning Plan

Under the landuse zoning from the Planning Department of the Government, Tung Lung Chau is zoned as a **Countryside Conservation Area**. There should not be any private development on the island except existing native villages.



South Eastern New Territories Sub-Region Land Use Plan

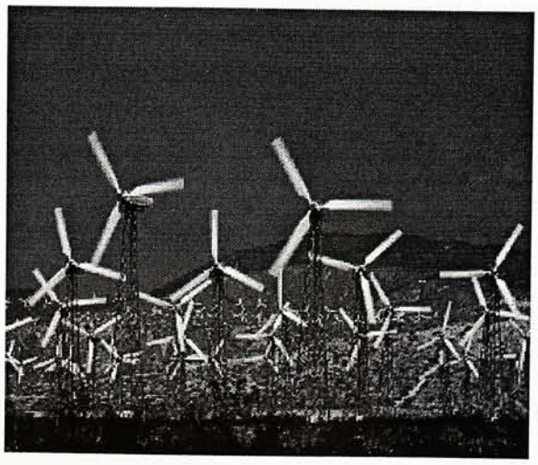
Since the development is to promote the public to experience natural environment and to arouse their awareness of the environment, with the agreement of the environmental societies, **exemption** for the proposed observatory development can be made by the Councils. However, the building should be designed with minimum impact on the natural landscape and disturbance to the wildlives.

Without any available lease conditions or property held, a study has to be carried out to determine the site location, density and plot ratio.

Access and Amenities

Since Tung Lung Chau is an isolated island, amenities like electricity, water supply and so on has to be resolved. **Self sustainable** design concept may also be considered.

At the same time, as there is no existing vehicular access road in the island, it may restrict the construction methrod and the structural system of the complex.



Will the use of wind energy be applicable in this development?


FAT TONG MUN
path of leisure
NAM TONG
path of adventure
path of wilderness
path of rock
path of power
TUNG LUNG CHAU
primary path
secondary path
supplementary path
path without paving

OPPORTUNITIES - EXISTING STATE

Making use of different Natural Features

Through the process of site analysis, it is observed that there are different parts of the island with **different character** and **mood**. These are shaped by their corresponding orientation, altitude, topography, vegetative cover and type, local climate and also existing artifacts.

By careful examination and selection of existing paths, visitors to the island can experience and enjoy the **different kinds of nature** through this network of pathways. At the same time, **minimal** additions to certain parts along the paths, especially the transition between paths with different characters can form **nodal points**. These nodal points can serve as relaxing educative points by making use of existing natural settings and enhance visitors' pyschological sense of safety and their orientation.

For example, at the headland along the eastern coast is a good place for watching the sunrise. Certain natural features, like locally found rocks or stones, can be put together to mark the position of sunrise on summer solstice and winter solstice. This kind of approach may educate the visitors within a real and natural environment.

Paths with different "nature":

1. ***going along path to the NE part of the island***
2. ***view to the Fat Tong Mun and the birds resting on a tree trunk ruin***
3. ***cliff and waves along the NE coast of the island***
4. ***grass covered slope with bolders and onshore breeze in the NE part***
5. ***unobstructed east facing view headland***
6. ***path of adventuous in the central part of island framed by trees***
7. ***streams running down a valley***
8. ***path linking to the rock carve with primitive feeling***
9. ***butterflies' paradise along the primitive path***

OPPORTUNITIES - EXISTING STATE

Sustainability and Energy from Nature

Though currently there is certain level of power supply in the island, the power from the main outside the island to the proposed complex will be very limited unless extensive wiring is carried out.

This forms a challenge and an opportunity to test the **self-sustainable** concepts and use of **energy from nature**. It can make the complex less dependent on the outside resources and work as a live demonstration to educate the visitors.

As the prevailing wind in Hong Kong comes from the east, it is windy on the eastern part of the island and less so on the southern side of the ridge. The **wind** is especially strong along the ridge and the cliffs along the eastern coast. The **waves** along the southern and eastern coast are also very strong as these areas are exposed to the strong wind with no island in front. With a little amount of high trees along the southern side of the ridge offering no shades, the **sun** is very strong in these areas.

The solar energy may form the potential natural energy resources that can be incorporated into the design. Others energy resources such as micro-hydro by running water, combustion of dry waste or wood and tidal power may have to further explored.

Security

The Tung Lung Chau island has an advantage over other areas that are directly linked to urban developments or larger islands with existing infrastructure. This is the security inherent in the island. The physical isolation and inaccessibility of the island will deter people from coming to the island just to commit crimes or illegal immigrants from landing. This allows a more open architecture and open running policy which suit the function of overnight star gazing.

DISCUSSION OF ISSUES - EXISTING STATE

The analysis of Existing State identifies several important issues that require more in-depth discussions. This chapter examine these issues.

Attitude towards Nature

With this thesis, an underlying philosophy to the treatment of fragile nature is assumed. This philosophy needs clarification and further elaboration.

Leaving Nature untouched is not the best solution.

Under the policy of the Government to conserve the fragile nature, more than 60% of the Hong Kong area are kept as green area. However, some six million people congested into the remaining limited areas. This is very important for Hong Kong in order not to spoil all the natural environment under the high pressure of building demand. However, is this the best approach to just keep any general public away from the natural environment so as to "*preserve*" it and to allow the urban dwellers to continue ruining the developed regions through environmental degradation?

On the other hand, can more people be moved by the invaluable nature through their own experience?

Only person with affection for nature will care for nature.

For better educated and environmental conscious people, keeping what is nature, they can appreciate the untouched natural settings. For most of the commercial minded general public in Hong Kong, certain facilities are required that bring them closer to nature which may be felt peace, harmonized or frightening, dangerous. Unless they can experience nature, they will unlikely care about nature.

From this point of view, this thesis will attempt to provide reasonable facilities and amenities **additing to the natural environment** in order to enhance the general public in experiencing nature instead of leaving them untouched. In addition, some **nodal points** along the existing paths will also be studied but not in detail for **exploring the possibilities** of different **natural settings**.

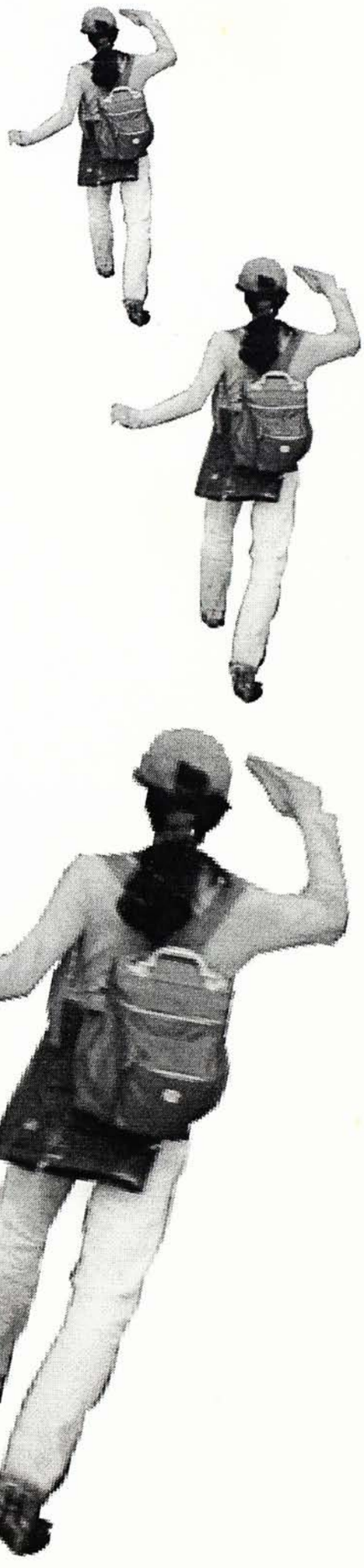
DISCUSSION OF ISSUES - EXISTING STATE

Degree of Public Access

The complex for celestial observation will be targetted for all general public access. But in terms of the whole island, the degree of public accessibility is an important issue.

Basically, the general public has the **freedom** to go to anywhere as the environment is **public asset** and **experiencing nature** is the primary objective.

However, the existing paths will not be improved to a level of promoting easy public access to the whole island. Instead, **different hierarchy** of path accessibility should be developed. This is to **retain the original characters** of the paths and to **prevent high level destruction** to the environment by the large number of visitors resulted from easy access.



Media and Learning Environment

After analysing the existing astronomical facilities in Hong Kong, some major guidelines are discovered which will help to shape the directions of the proposed complex. For this type of facilities, very formal educative media are the major communication channels, such as display of images and models. Topics and lectures are for more formal occasions.

The relationship between observers and exhibit is found to be very passive. To improve this situation, some newer interactive installations that are more popular and can communicate more effectively are used.

As a complementary facility to those already available, a more informal, leisure environment is intended to be provided. It is important that the development will concentrate on **participatory learning in a relaxing and inspiring atmosphere** and more **interesting astronomical topics in special spatial quality**.

The underlying philosophy is **to arouse visitors' interest and let them explore more in depth rather than forcing them to learn any information or data**.

Technology and Nature

experience the celestials in nature

. . . enhanced by technology & artifacts

To complement existing astronomical facilities in Hong Kong, this complex will focus on the self experience in nature which brings to the participants the real world they are in; instead of an artificial one.

However, this does not imply the complex will eliminate all the artificial environment or technology in use. In the contrary, latest technology and artifacts will also be integrated to complement the insufficiency in nature.

Application of technology is not to distract man from nature, but to provide more favourable environment for the participants even at times the weather is bad. It also allows the participants to look at nature at different levels and provides a transparent network linking to other places in the world.

Visibility

In the scope of astronomical observation, two measurements of visibility are often used: **transparency** and **seeing**. Transparency refers to the degree of how far or how dim a celestial object we can see. Seeing refers to the stability of air current which affects most when looking at near celestial objects.

Due to Hong Kong's sub-tropical climate, the degree of transparency is inherently restricted and making it not a good place for professional astronomical researches. However, this does not have great impact on astronomical amateurs' observing activities as they seldom look at celestial objects that far.

Instead, the degree of seeing is far more important when considering naked eye star gazing and near celestial objects observation (eg. the planets and the moon). The degree of seeing can be controlled by the nature of **surface materials** in the surrounding such as grass and water is more preferable than concrete.

Night view of Kitt Peak Observatory, Arizona, USA

FORMULATION OF PROGRAM - FUTURE STATE

Mission

'To create a relaxing and inspiring environment to arouse and enhance visitors' interest in experiencing and appreciating nature through the provision of optimum spatial and technical facilities that would encourage visitors' participatory observation."

The facilities in this development will be in the role of complementing other existing facilities in Hong Kong to provide more comprehensive and holistic recreational services to the public, thereby ultimately evoking the participants' consciousness in astronomy and nature conservation.

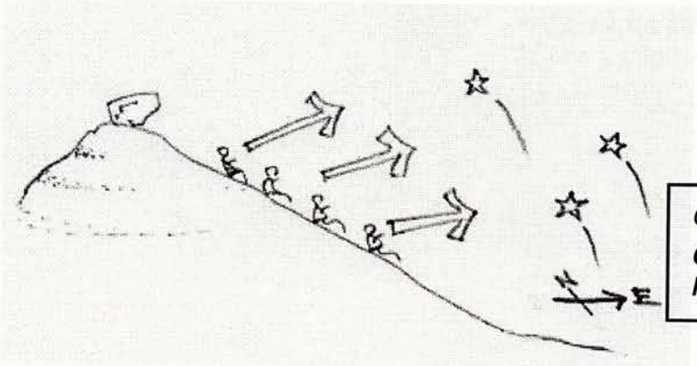
Issue: Visibility

Goal 1: ***The development should provide venues which can optimise naked eye celestial phenomenon observation.***

PR1.1: Orientation of the venues for naked eye star gazing should allow maximum vision to the eastern sky so that participants can watch the rising of celestial objects.

Concept 1.1.1:

Observation platform can be horizontally scattered along the contour to maximize observing area.



Concept 1.1.2:

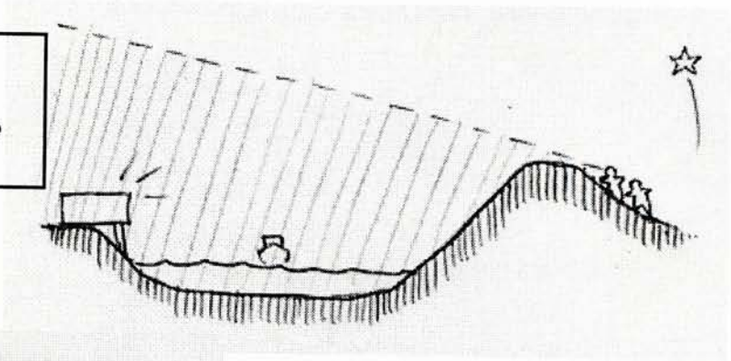
Observing activities can be located down the slope.

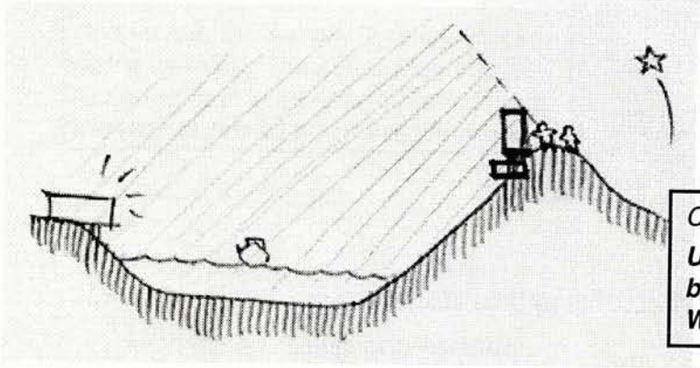
Issue: Visibility

PR1.2: The naked eye star gazing venues should have minimum impact from the artificial lighting on the surrounding developments.

Concept 1.2.1:

Take the advantage of existing landform and use the slope opposite the Clear Water Bay Club House.





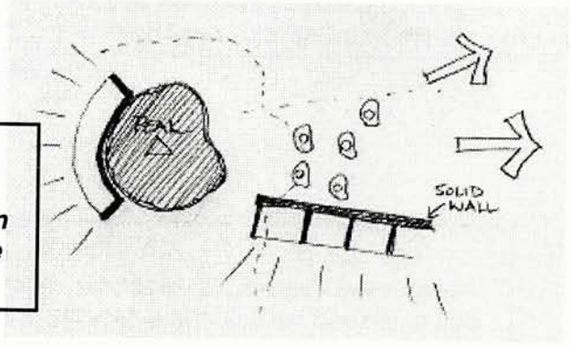
Concept 1.2.2:

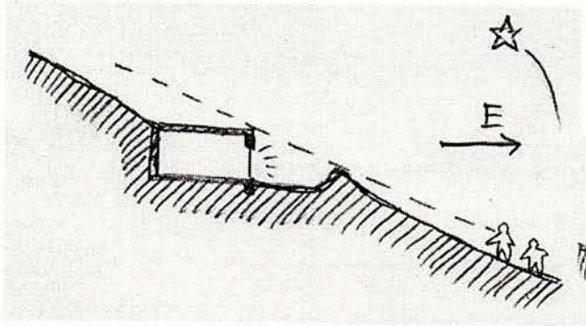
Use of man made elements such as building to block the light from Clear Water Bay Club House.

PR1.3: Any interior or exterior lighting fixtures in the complex should be located out of the direct vision from the naked eye star gazing venues and no upward lighting should be installed.

Concept 1.3.1:

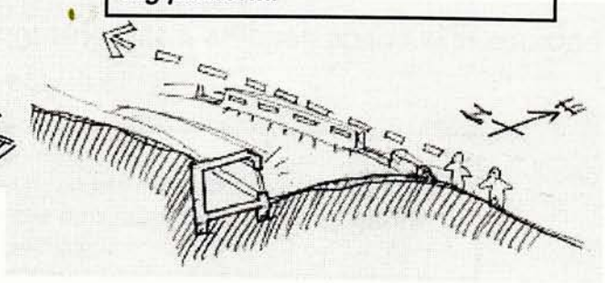
By using the natural landform such as the peak to separate zones with lighting emission and the observing platform. Or restricting the openings to the observing platform.





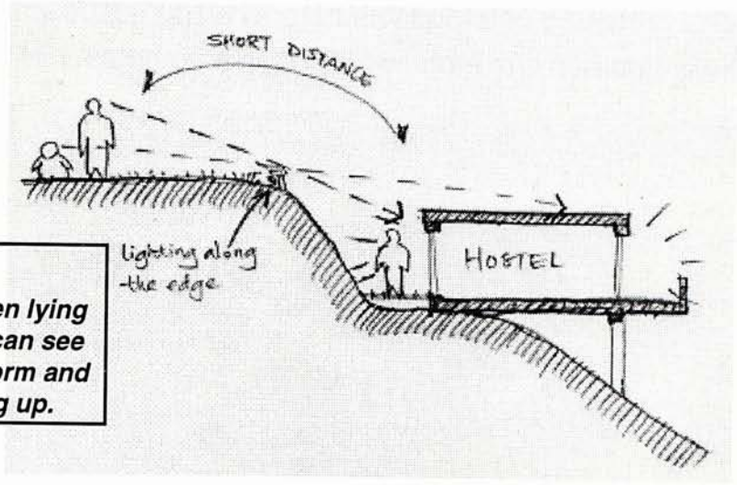
Concept 1.3.2:

By manipulating level changes to restrict light affecting the observing platform.



Issue: Visibility

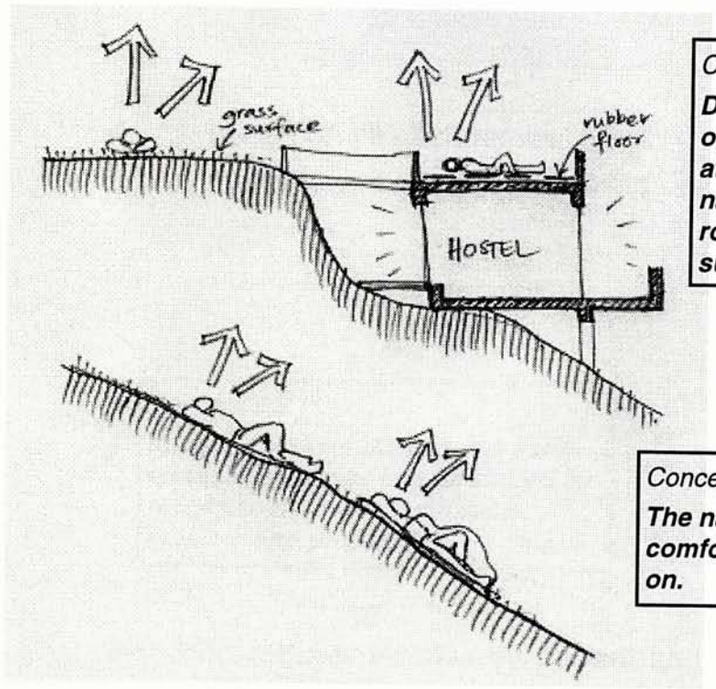
PR1.4: Sufficient lighting indication from naked eye star gazing venues to accommodation facilities have to be provided for easy orientation while distance between the two should be within 2 minutes travelling time.



Concept 1.4.1:

People cannot see the light when lying down watching the stars; they can see the edge of the observing platform and the way to hostel when standing up.

PR1.5: Finishing materials and profile of the ground should allow star watchers to lie down comfortably.



Concept 1.5.1:

Different surfaces are provided: grass of the natural slope to provide better atmosphere of keeping in touch with nature. Rubber floor finishes on the roof of hostels provide a comfortable surface even in high humidity weather.

Concept 1.5.2:

The natural slope already provides a comfortable surface for people to lie on.

PR1.6: To enable naked eye star gazing class, an open space with appropriate technological support is required.

Concept 1.6.1:

An open space with optional tensile cover and wireless network installation to enable communication among tutors and participants through computer.

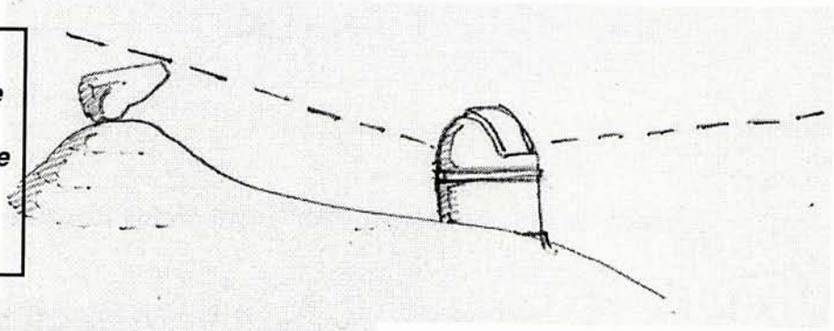
Issue: Visibility

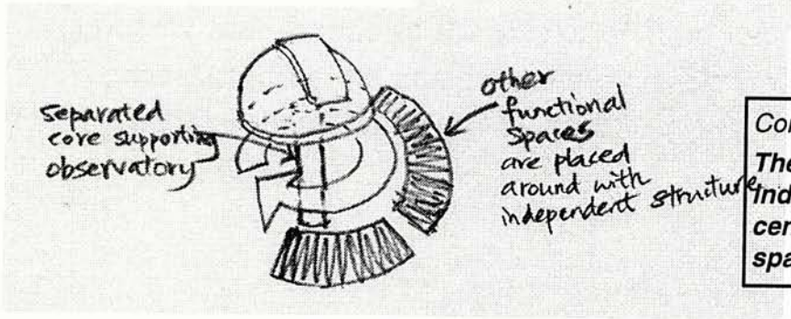
Goal 2: ***The complex should provide optimum facilities for more in-depth celestial observation.***

PR2.1: A computer controlled 20-30 inch astronomical telescope should be installed inside a dome shape observatory with separated structure. This observatory should be located on a high point without any nearby visual obstruction.

Concept 2.1.1:

The observatory can be located on the eastern side of the "rock tower" to obtained unobstructed N-E-S view. The observatory can also be raised up to minimise the vision obstructed by the rock.





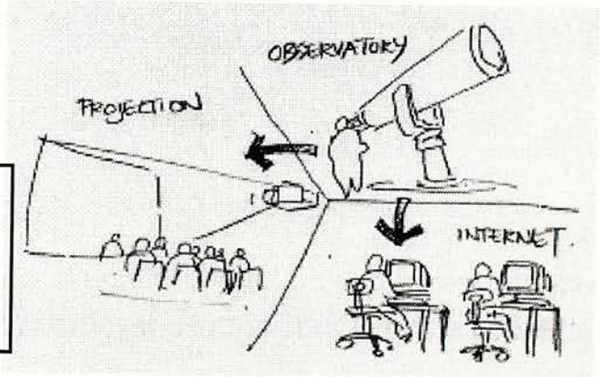
Concept 2.1.2:

The observatory can have independent structure in the centre while other functional spaces surround it.

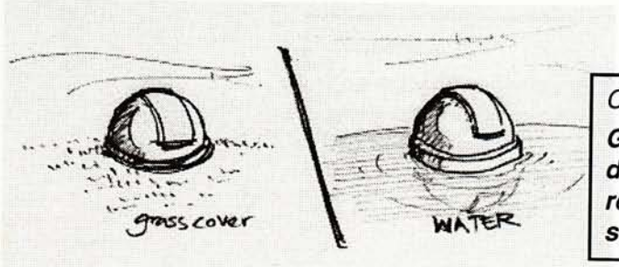
PR2.2: Usage of the astronomical telescope should be planned as efficiently as possible to avoid people feeling bored while waiting in the queue.

Concept 2.2.1:

Images obtained through the astronomical telescope can be shared by more people through computer network and projection.



PR2.3: To reduce unstable air current and improve seeing, concrete surface around the observatory should be kept minimum.

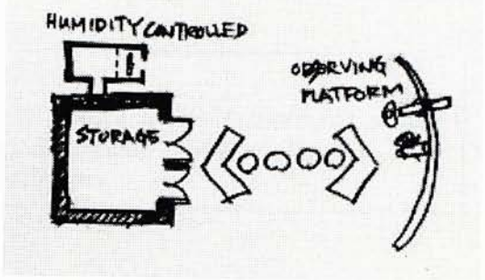


Concept 2.3.1:

Grass surface or water can be designed around the observatory to reduce uprising air current just after sunset.

Issue: Visibility

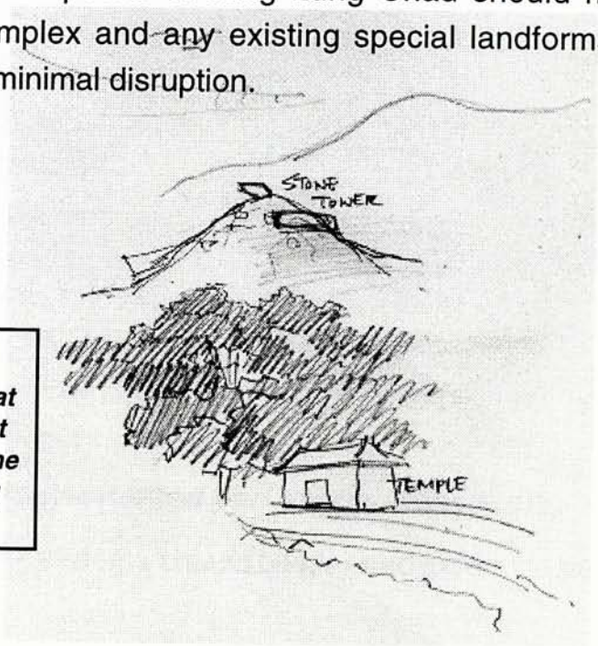
PR2.4: A humidity controlled storage area for portable telescopes and photographic equipments should be provided with convenient access to observing area.



Issue: Environment

Goal 3: ***Any man made structure should have minimum negative visual impact on existing nature.***

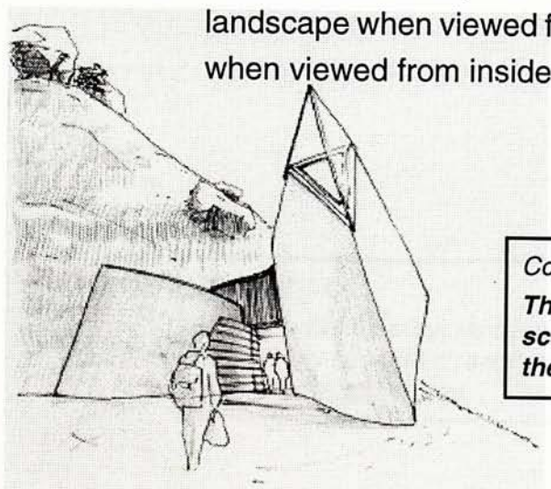
PR3.1: View from ferries to the peaks of Tung Lung Chau should not be obstructed by the complex and any existing special landforms and features should have minimal disruption.



Concept 3.1.1:

The proposed facilities can be placed at a lower level around the peak so as not to obstruct the view to the rock from the ferry while letting visitors approaching the site seeing the facilities.

PR3.2: Architecture or any man made structure should be integrated into the landscape when viewed from outside; and frame or direct vista to nature when viewed from inside.

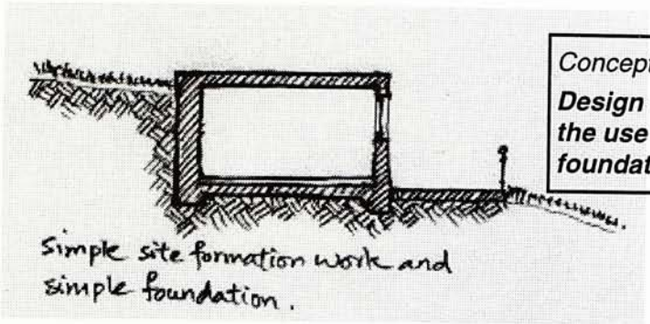


Concept 3.2.1:

The museum building can be more sculptural in form and even resemble the rock tower.

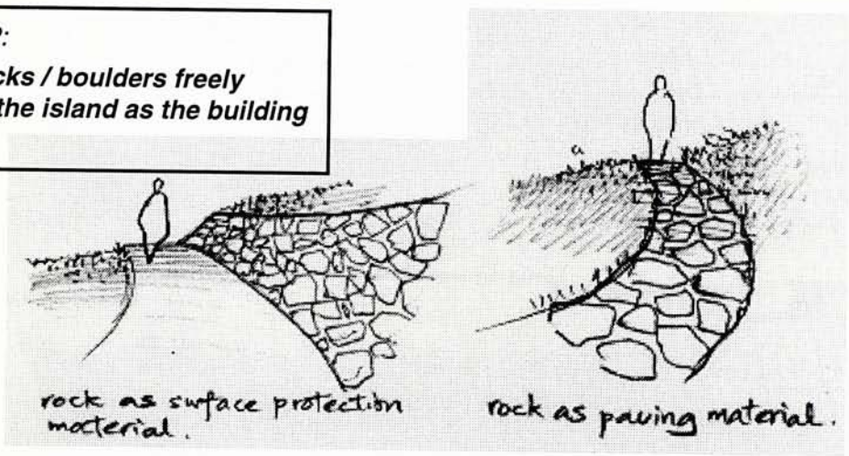
Issue: Environment

PR3.3: The building material and construction method should allow minimal on site work and avoid use of heavy construction equipment and machinery.



Concept 3.3.1:
Design with low rise building to prevent the use of deep and complicated foundation.

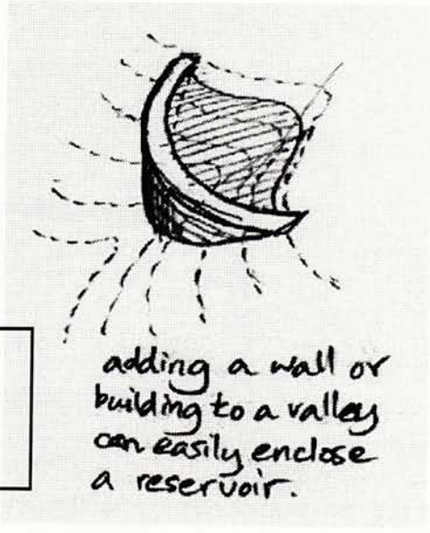
Concept 3.3.2:
Using the rocks / boulders freely available on the island as the building materials.



Issue: Environment

Goal 4: ***The complex should be ecology-oriented and energy-conscious.***

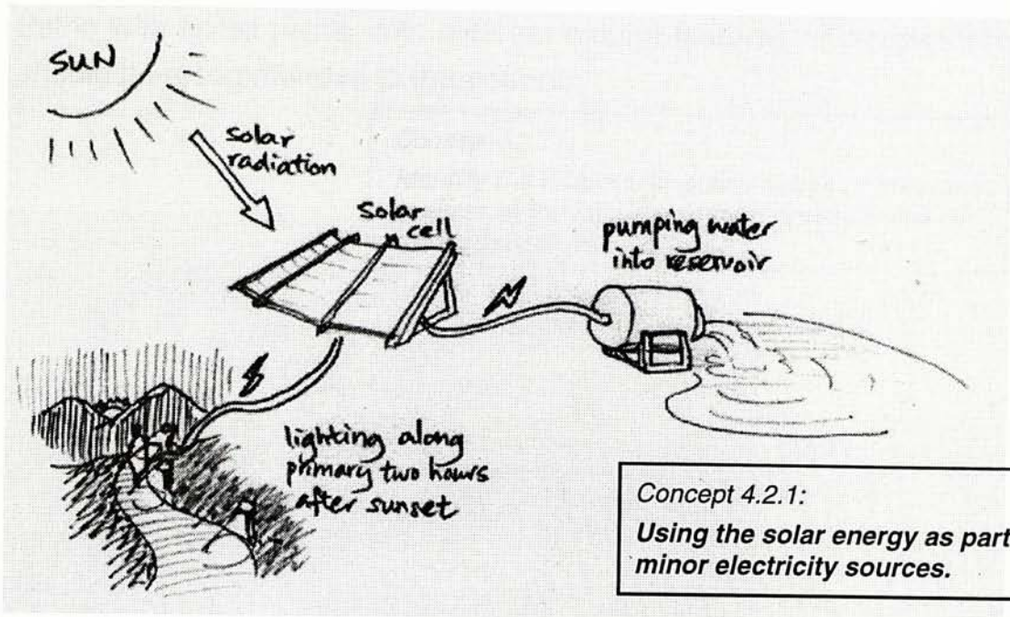
PR4.1: Storage of water from the streams should be planned to reduce demand of central water supply.



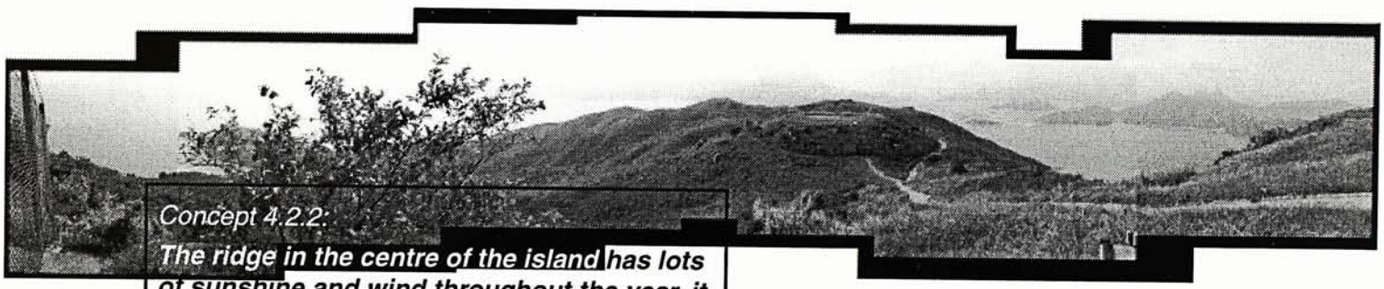
Concept 4.1.1:
Utilising the existing landform such as a valley to build a reservoir in a more economical way.

Issue: Environment

PR4.2: Usage of natural energy should be explored to operate more environmenal friendly and serve as demonstration to public.



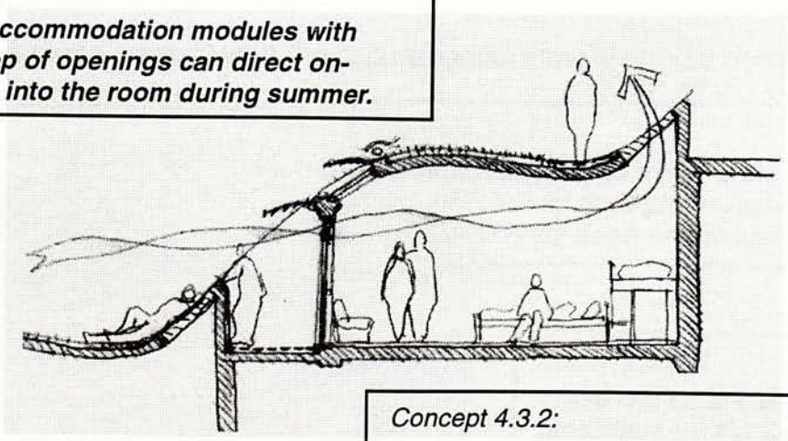
Concept 4.2.1:
Using the solar energy as part of the minor electricity sources.



Concept 4.2.2:
The ridge in the centre of the island has lots of sunshine and wind throughout the year, it may be an appropriate area for demonstration of using these kind of natural power.

PR4.3: Energy consumption of the complex should be minimised in every possible circumstance especially for the thermal control.

Concept 4.3.1:
East facing accommodation modules with louvres on top of openings can direct on-shore breeze into the room during summer.



Concept 4.3.2:
Integrating natural ventilation into the accommodation modules to avoid use of AC system.

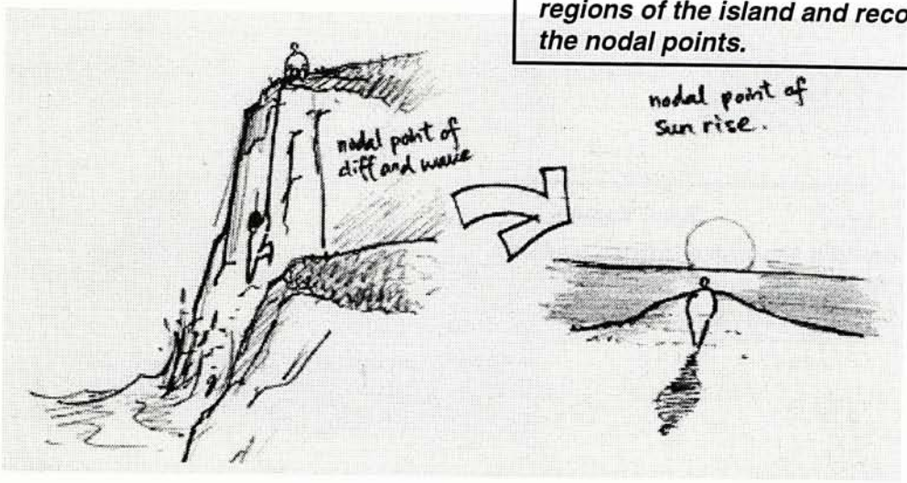
Issue: Mood / Ambience

Goal 5: ***The design should enable visitors to appreciate the beauty of nature with direct involvement in a safe environment.***

PR5.1: Paths with nodal points with different natural features or atmosphere should be recommended to the visitors.

Concept 5.1.1:

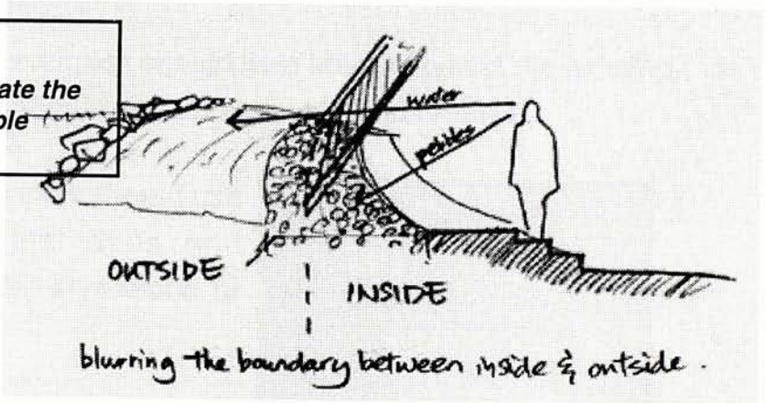
Identify the different characteristics of different regions of the island and recommend some of the nodal points.



PR5.2: Different areas in the complex should carry different spatial characteristics with playing of various natural elements.

Concept 5.2.1:

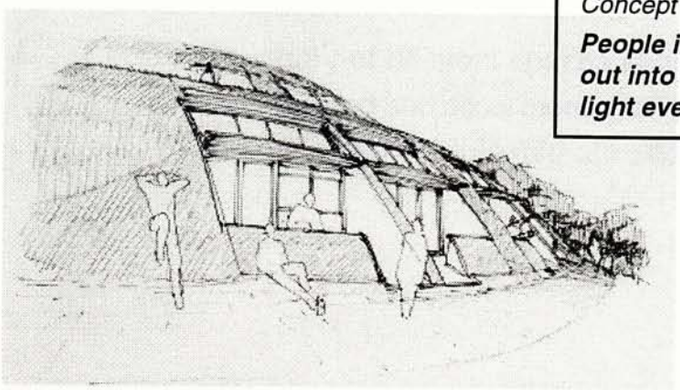
Bringing the outside into inside and create the layering of elements may make the people inside more in contact with nature.



PR5.3: A close contact with the natural environment should be designed for the accommodations.

Concept 5.3.1:

People inside the domitory units can look out into the sky through the inclined sky-light even lying down on the bed.



Concept 5.3.2:

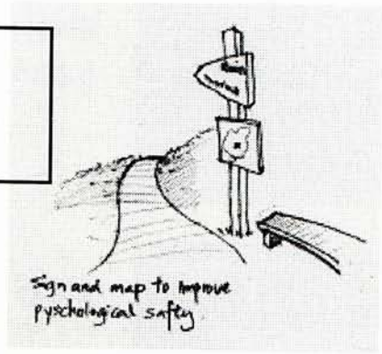
There can be different forms of grass cover landscape for the people to ly down looking at the sky.

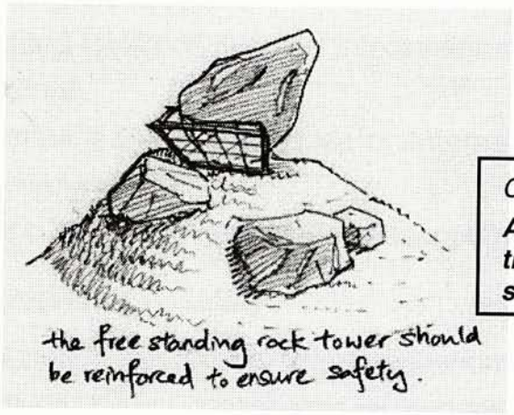
Issue: Mood / Ambience

PR5.4: Both physical and psychological safety of the visitors should be concerned along the paths.

Concept 5.4.1:

Signage and map of the island should be provided along the paths to improve visitors' psychological safety.





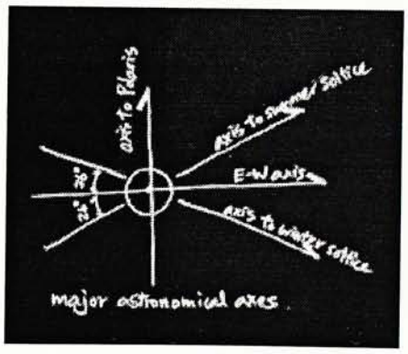
Concept 5.4.2:

Any natural elements with potential dangers to the visitors along the routes should have structural reinforcement.

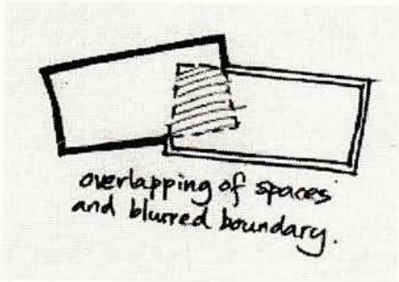
Goal 6: ***The facilities should arouse the visitors' interest in astronomy and nature in a casual and relaxing atmosphere.***

PR6.1: Whenever possible, the complex should take advantages of the existing natural elements to create relaxing and casual atmosphere.

PR6.2: The geometry of the complex should use the major astronomical axes and incorporate astronomical inventions or concepts.

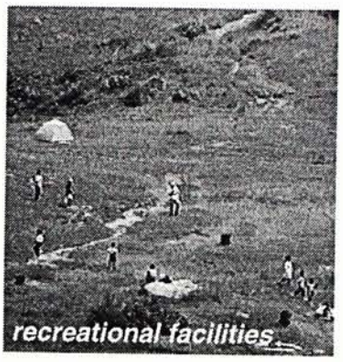


PR6.3: Boundary of different spaces should be more blurred and allow more overlapping to generate more informal atmosphere.



LIST OF ACTIVITIES - FUTURE STATE

After analysing the existing astronomical facilities in Hong Kong, observing the existing activities in the island and studying the nature of astronomical museum and observatory, various activities are predicted in the future operation of the complex:


recreational facilities

Educative activities

- visiting the museum
- looking for more detailed information and surfing in the internet
- seminars of special topics or international astronomy exchange forum
- workshops such as simple telescope making


climbers on the cliff

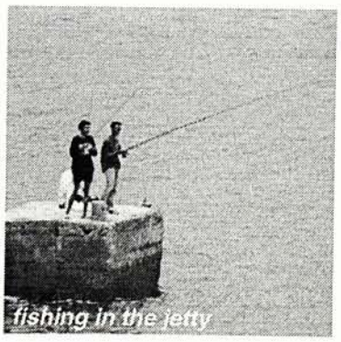
Observation activities

- naked eye star gazing/ celestial phenomenon observation
- observing through portable telescopes
- observing through astronomical telescope
- constelllation observation class


visiting the fort

Supplementary activities

- arrival orientation and check-in
- staffs maintaining the facilities
- simple catering in exhibition such as serving drinks and sandwiches
- self catering in overnight accommodation such as barbecue and cooking inside kitchen
- overnight activities such as sleeping inside hostel and sleeping inside wild camp
- going to restrooms


fishing in the jetty

Activities along the paths (existing)

- hiking
- recreation in country park
- rock climbing
- historic monuments / existing villages visit
- watching sunrise + sunset + natural scenery
- fishing
- camping
- landform survey field study

SCHEDULE OF ACCOMMODATION - FUTURE STATE

From the list of activities anticipated, there are five major functional areas in the future development, these include daytime facilities: *Museum* with simple catering, *Workshop*; nighttime facililites: *Observatory*, *Accommodation* and; *Supporting Utilities*.

Museum

- check-in counter — *240 m²*
- Museum of Space Science & Modern Astronomy — *870 m²*
- Museum of Ancient Myths (underground) — *1025 m²*
- cyber cafe with 60 seatings, workstation x 25 and projection screen — *300 m²*
- cyber cafe pantry — *25 m²*
- exhibit storage — *123 m²*
- general storage — *30 m²*
- restroom — *90 m²*

Workshop

- main studio with wireless network with projection screen — *120 m²*
- production studio x 2 — *@30 m²*
- computer server room — *20 m²*
- open plan office — *60 m²*
- general storage — *30 m²*
- staff restroom — *8 m²*

Observatory

- 40-inch computer controlled astronomical telescope in separate structure observatory — *50 m²*
- waiting foyer — *60 m²*
- computer laboratory for observatory — *24 m²*
- portable telescopes storage — *30 m²*
- classrom with portable computer x 20 and indoor wireless network — *150 m²*
- outdoor observing platform with wireless network for constellation observation class and portable telescope observation (outdoor) — *150 m²*
- general storage — *15 m²*
- restroom — *40 m²*

SCHEDULE OF ACCOMMODATION - FUTURE STATE

Accommodation

- group module w/ 8 beds x 10 *@44 m²*
- family module w/ 4 beds x 4 *@24 m²*
- couple module / guest room w/ 2 beds x 4 *@24 m²*
- staff module w/ 2 beds + toilet x 2 *@32 m²*
- wild camp site & barbecue site (outdoor)
- common room / dining room *35 m²*
- kitchen *25 m²*
- bathroom w/ toilets: male + female *35 m²*
- laundry *15 m²*
- storage *15 m²*

Supporting Utilities

- small reservoir for fire services system and flushing water
- water tank w/ 1 week fresh water storage
- water pump room
- transformer room
- backup electricity generator room
- solar energy receiver
- E & M rooms

Spatial requirements of the **Museum of Space Science and Modern Astronomy** are developed based on the precedent analysis of local and overseas related facilities and recommendations from Sky Observers' Association (HK) and other related bodies.

The **Museum of Ancient Myths** will accommodate permanent exhibits in different inspiring spatial settings. No strict spatial dimensions or relationship can be defined for the museum spaces, instead, themes integrated with different natural elements reflecting ancient myths or cosmologies will be the determining factors.

Demand for accommodation will fluctuate dramatically in different seasons (from ~20 to >200). To address this issue, domitories together with wild camp site are provided to make it more **flexible** while keeping it feasible. In addition, it also allows the participants to have the **freedom of choice**.

every time we look at stars,
we are looking at something thousands years ago

DESIGN PHILOSOPHY - DESIGN PROPOSAL

Architecture & Nature

Optimum visual impact on nature and integration with landscape.

The main objective for the development is to provide an environment that would enhance visitors appreciating nature. Architectural spaces and any man made structures as a result serve as a complementary role with nature. They are **not to dominate** the existing beautiful **landscape** nor to be hidden or cut away from it. The spaces are to be integrated with the landscape to maintain a close relationship between man and nature while inside; and to form a new landscape while outside.

Natural Phenomena & Associated Myths

Different natural elements phenomena and the associated myths will be studied and interpreted individually to magnify their characteristics. Architectural spaces are to be generated to physically manifest or enhance the mood for the interpretations.

As a result, it is **a serious of experiences** through which visitors recognise various natural phenomena and learn their associated myths.

Integrating into landscape

To most people, sky watching activities assume an up-pointing expression on the architecture. However, the final external expression of the complex is kept minimum, or optimum, with integration into the landscape can be explained in following:

1, looking at distant stars is actually **looking at** something in **the past**, this generates a back looking force.

2, the ancient myth and cosmology museum strengthens the force of **diggout out the past**.

3, **minimal visual impact** on the existing natural environment has to be attained.

SITE ASPECT - DESIGN PROPOSAL

Site Selection in Tung Lung Chau

From Site Analysis on existing features and path conditions (p.15), major activities on the island can be found on the northeastern part where the country park and villages are located. With the following considerations, the local peak with rock tower (point 2 in p.15) is selected as the site for development.

The area is on the way of the most popular path and situated at a high point (+86.3), though not the highest, on the island. It is just within 10 minutes walking distance from the pier and is visible from most part of the island.

An unobstructed view to the eastern horizon can suit the 'sky' watching activities well. With fragments of rocks scattering on the grass covered surface and gentle eastern sea breeze blowing most of the time, a relaxing mood can be easily attained.

Constructing on the grass covered surface induces less impact on the environment and ecology when compared with that on areas with bushes or trees.

SITE ASPECT - DESIGN PROPOSAL

Vehicular Access

Since Tung Lung Chau is an undeveloped island, there is no vehicular access in the island except that linking the navaids station to the pier on the southern side of the island. At present, there is no vehicle on the island and there will not be the need for vehicle on the island except for the construction and maintenance work.

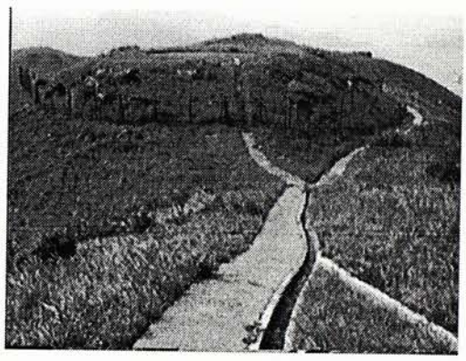
To preserve the existing remoteness atmosphere and not to ruin the natural setting, no permanent vehicular access road is preferred to be constructed. As a result, special scheduling for the construction and maintenance of the complex have to be sort out. These issues will be further examined in the Construction Sequence section. (p.99-101)

Pedestrian Access

Pedestrian access will rely mainly on the existing paths. Upgrading works will be carried out to improve the safety and comfort of the primary paths. (please refer to p. 15, 20 & 38)

Because of the nature of the natural environment, visitors with physical disabilities are less likely to use the facilities. Extensive works to make the whole island accessible to these people will impose a great cost and adverse impact on the natural environment which are undoubtedly infeasible.

To address this access issue, machines that assist visitors with physical disabilities to move in steps and steep ramp will be adopted. Similar machines are being used in some MTRC stations. Through this, construction cost and environmental impact on the landscape can be significantly reduced.



top

Existing pedestrian access path to the site

far above

Path without paving resulted from frequent walking

above

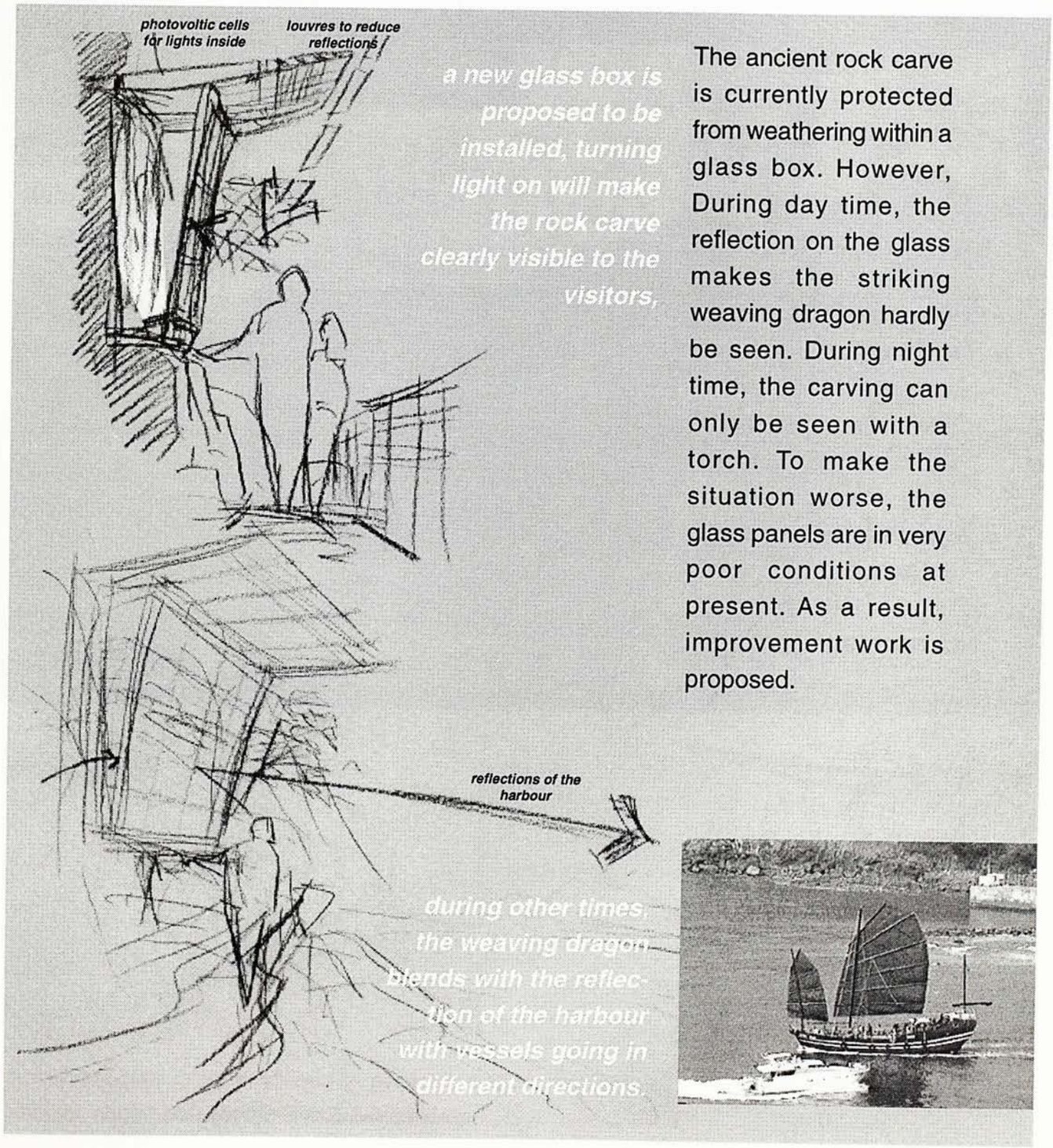
Well paved path along the ridge connecting the navids station and helipad

SITE ASPECT - DESIGN PROPOSAL

Additions to the Island

As discussed in Making use of different Natural Features of Opportunities section (p. 20), some simple installations are proposed to improve existing functional conditions or to amplify the different "nature" along different paths. The followings are three examples.

Protecting the rock carve



The ancient rock carve is currently protected from weathering within a glass box. However, During day time, the reflection on the glass makes the striking weaving dragon hardly be seen. During night time, the carving can only be seen with a torch. To make the situation worse, the glass panels are in very poor conditions at present. As a result, improvement work is proposed.

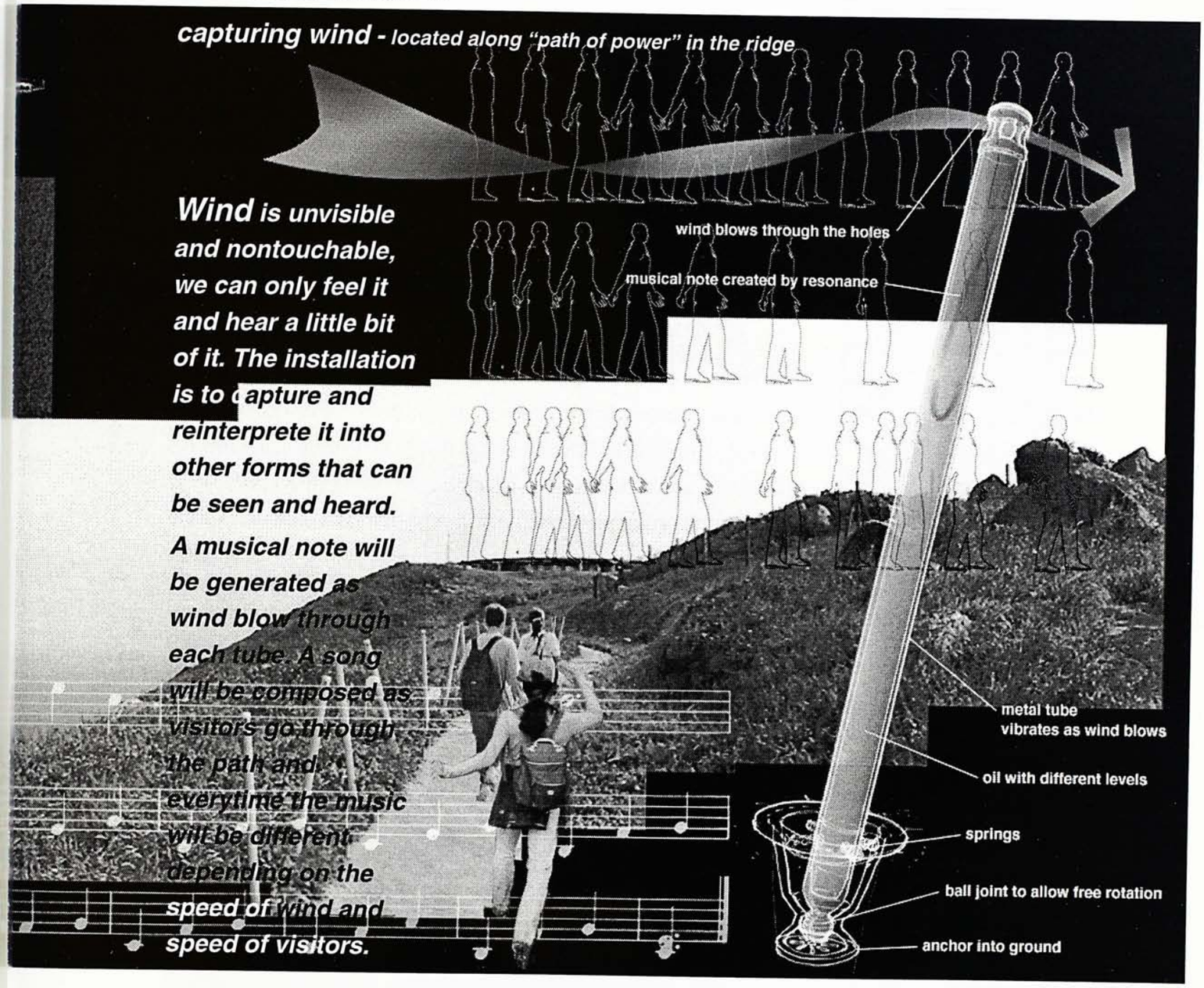
SITE ASPECT - DESIGN PROPOSAL

Additions to the Island

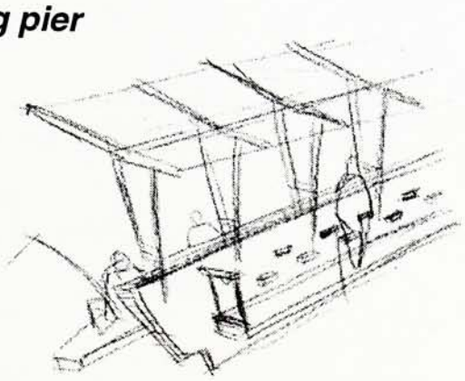
***capturing wind** - located along "path of power" in the ridge*

***Wind** is unvisible and nontouchable, we can only feel it and hear a little bit of it. The installation is to capture and reinterprete it into other forms that can be seen and heard.*

A musical note will be generated as wind blow through each tube. A song will be composed as visitors go through the path and everytime the music will be different depending on the speed of wind and speed of visitors.



fishing pier



A fishing pier is considered to provide some shelters and to separate circulation from sitting.

DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 1, First Review - 24 October, 1997

Emphasis were placed on the island as a whole before the first review. Studies of different "nature" along different paths with different potentials were carried out. The concept was to distribute the exhibits over the island at different nodal points (p. 15, 20, 40 & 41). The intervention works should be optimal but they would express the unique natural characters at specific point. The objective is to enable visitors recognising the different natural phenomena and appreciating the fragile nature in real natural settings.

For the astronomical complex, it composed mainly the observatory & supporting facilities and the accommodations on the east facing slope. A large natural observing platform is defined by the man made structures which block unwanted light to be seen from the platform (pls. refer to the light control section).

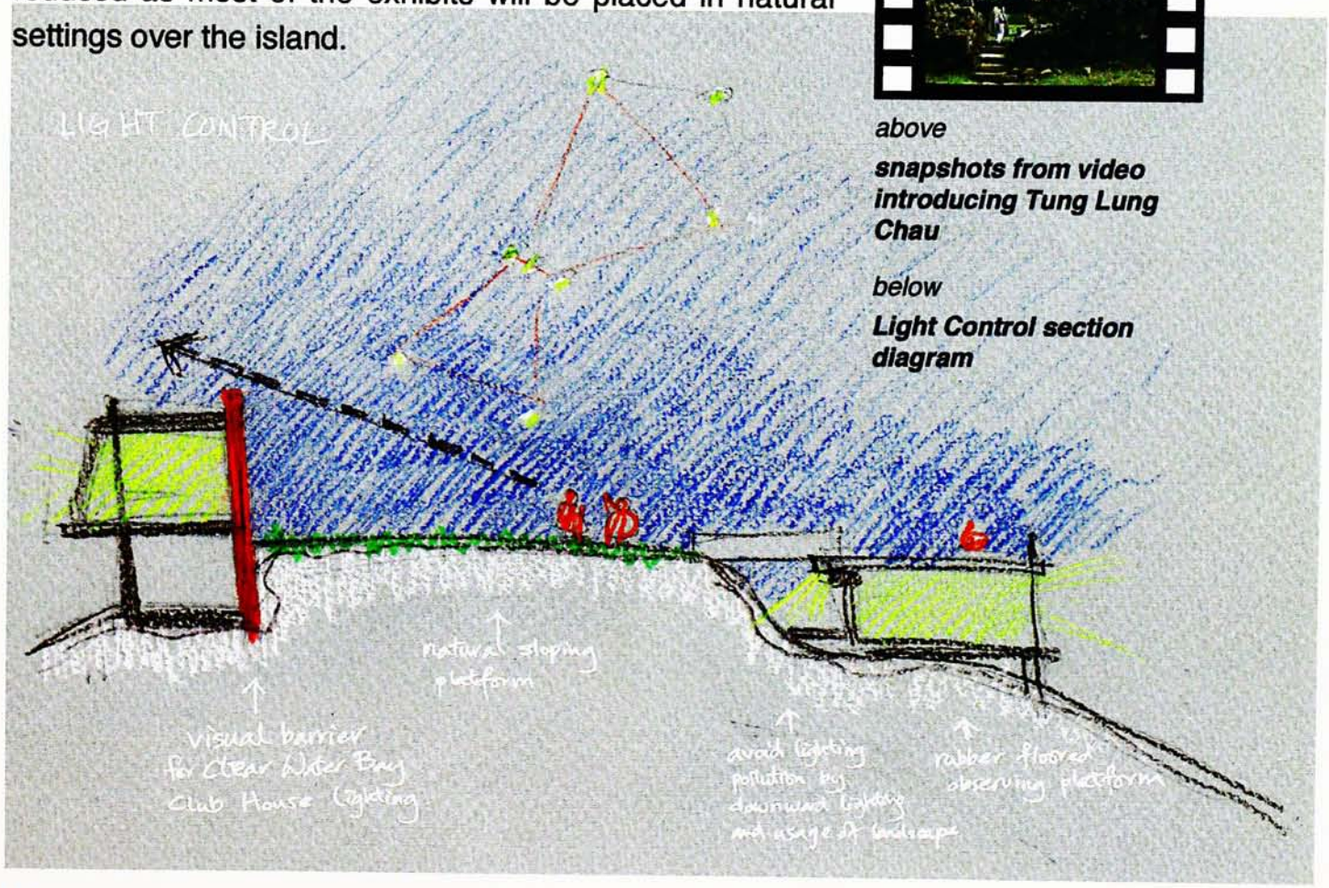
Day time function including exhibition and internet cafe are placed on the western side of the local peak to avoid light pollution to star gazing activities. Spaces for exhibits are reduced as most of the exhibits will be placed in natural settings over the island.

above

snapshots from video introducing Tung Lung Chau

below

Light Control section diagram



DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 1, First Review - 24 October, 1997

left
Site photo from the ridge on the island

below
List of activities foreseen

bottom
Option 1 zoning plan

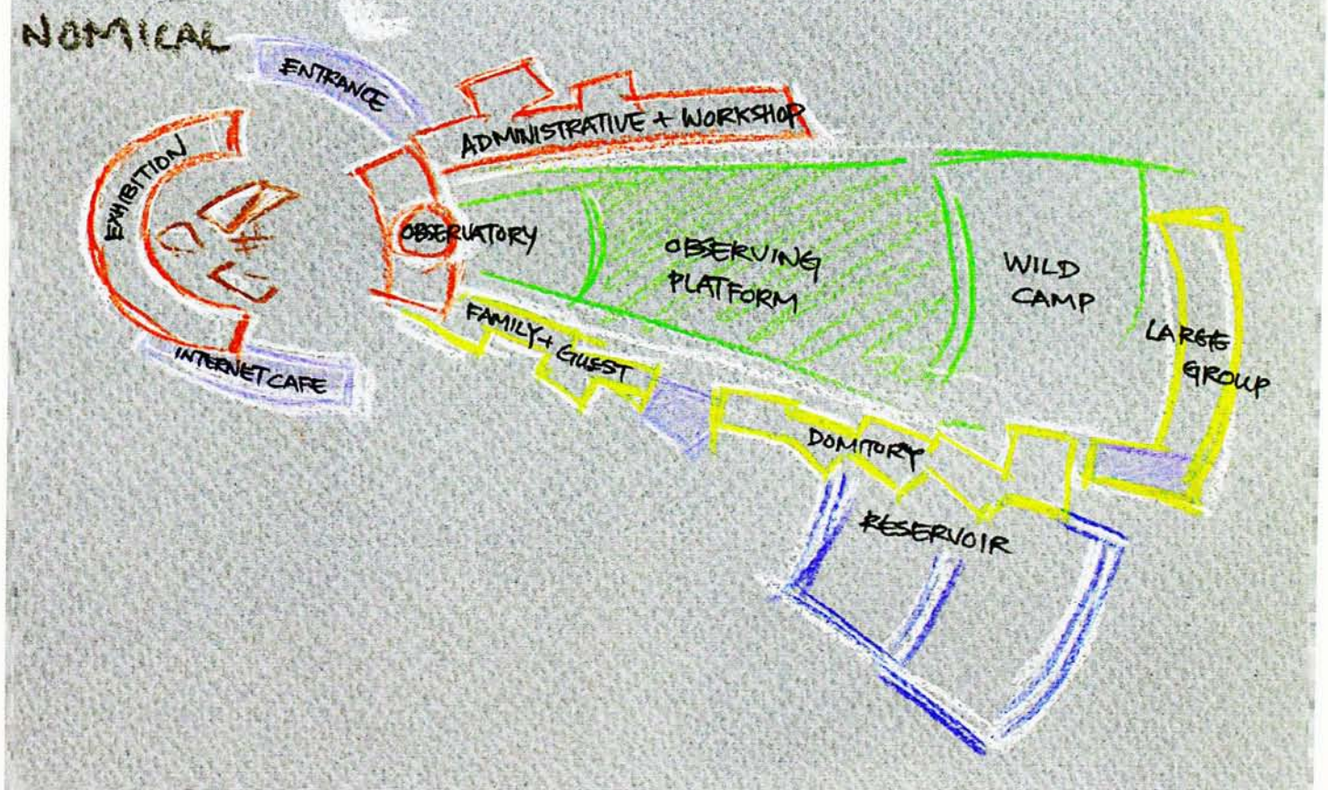
Educative Activities
- ***learning through interesting topic exhibit***
- ***seminar***
- ***workshop***

Observation Activities
- ***naked eye star gazing***
- ***observing through portable telescope***
- ***observing through astronomical telescope***
- ***star gazing class***

Supporting
- ***self catering***
- ***overnight activities***

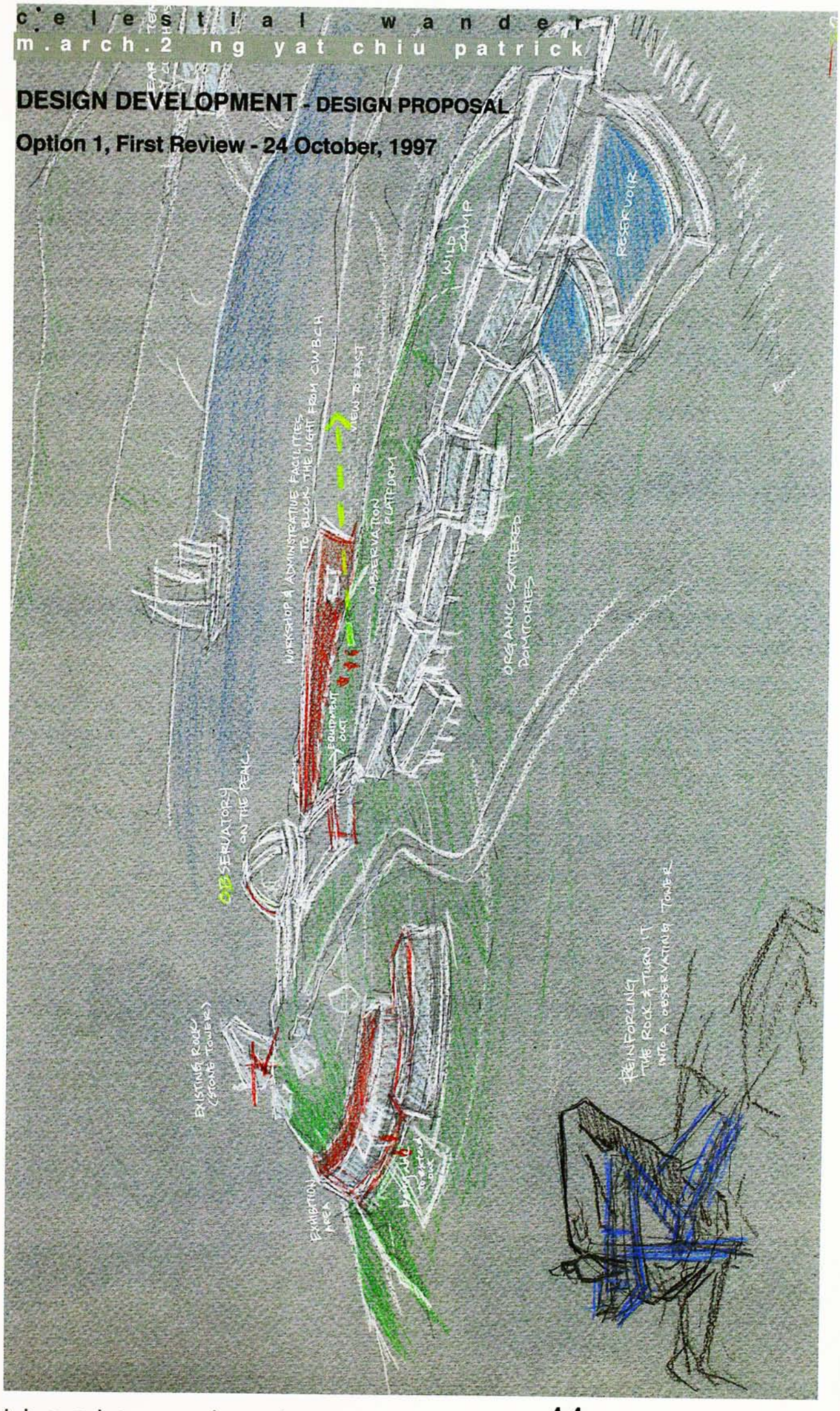
Feedback

Comments on the efforts spent on looking into the island and the affection towards nature were quite positive. However, reviewers emphasized the impact on the natural environment demand great care and close attention. The extent of addition to the island should be kept minimum and more effort should be put on the complex and environmental related issues.



DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 1, First Review - 24 October, 1997



DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 2, Section Pinup - November, 1997

The site planning strategies changed from a defined developed segment of the local peak to a more scattered fragments of developments. The existing natural landscape was more emphasized.

Three major functions including exhibition, observatory and accommodation were separated and spreaded on the area.

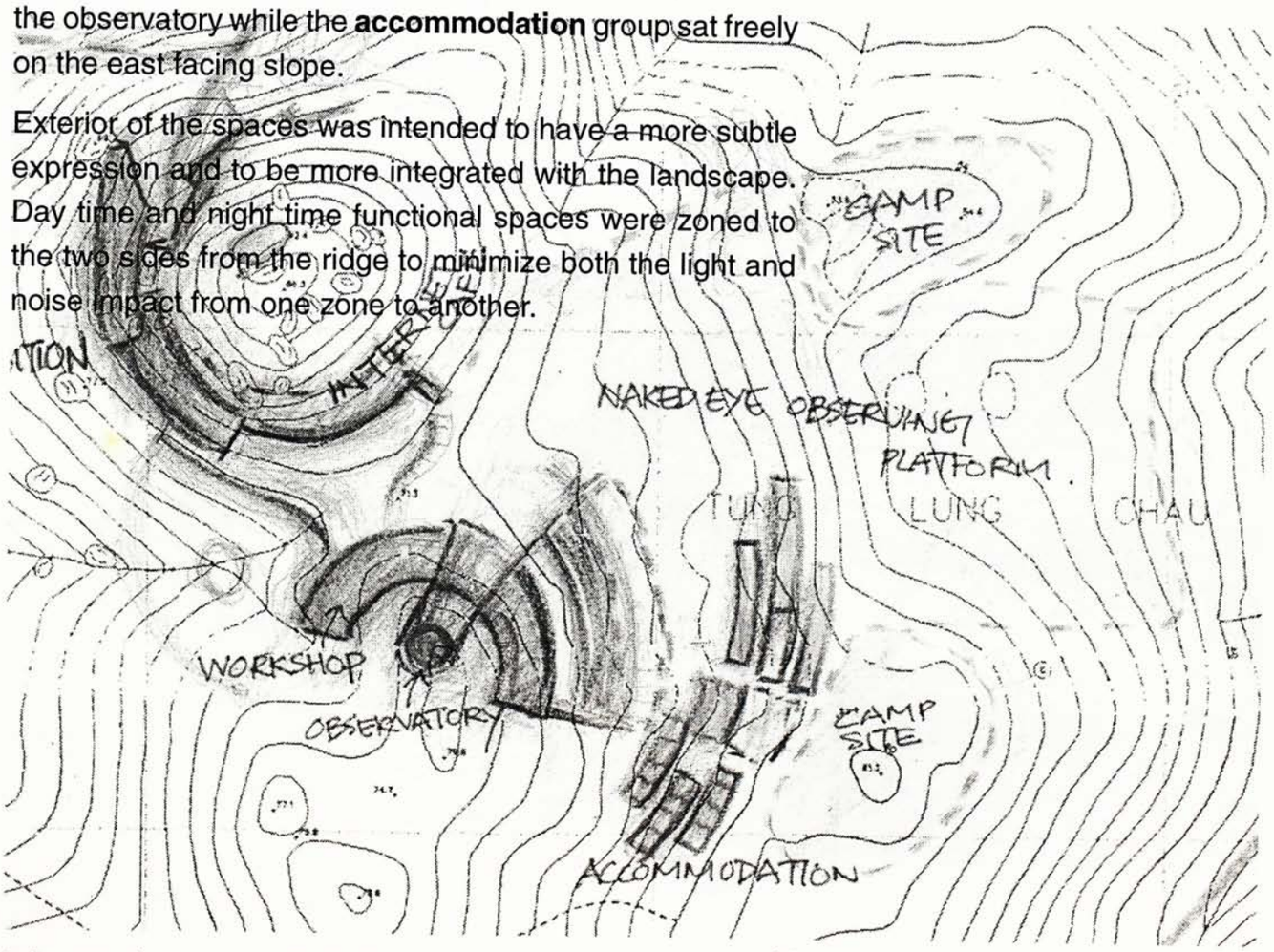
Instead of spreading most of the exhibits out over the island along the paths which implied more extensive impact on the natural environment, major exhibitis were drawn back to a centralised area with indoor and outdoor spaces. The **exhibition** space is more like a sculptural form warping around the rock tower.

The **observatory** sat on the highland next to the rock tower peak with its related functional areas around. This set up another focal point against the rock tower. A cafeteria set up an underground linkage between the exhibition space and the observatory while the **accommodation** group sat freely on the east facing slope.

Exterior of the spaces was intended to have a more subtle expression and to be more integrated with the landscape. Day time and night time functional spaces were zoned to the two sides from the ridge to minimize both the light and noise impact from one zone to another.

Feedback

Minimal visual impact on the existing natural landscape might worth trying from the comments, however, the relationship among the elements should be further developed.



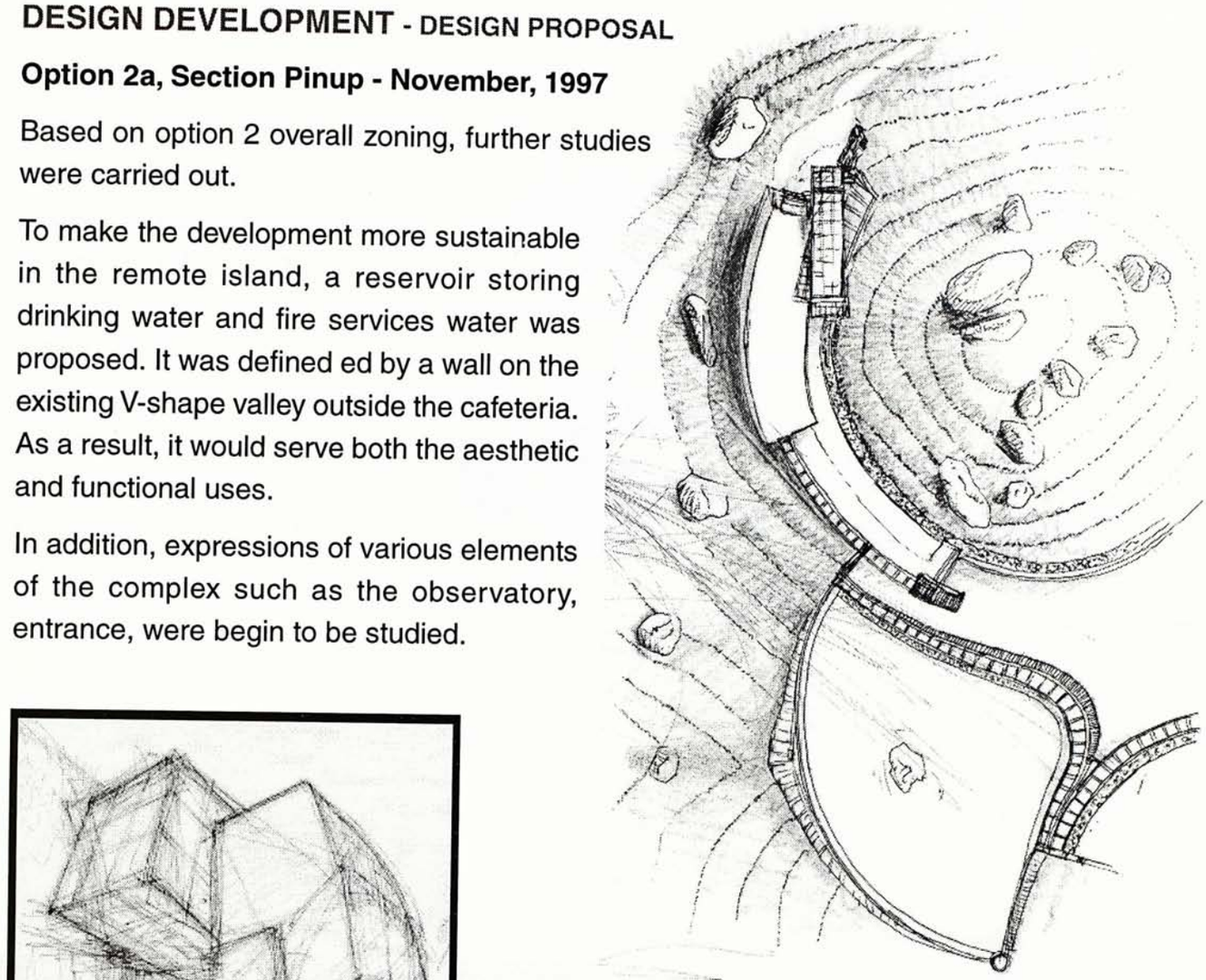
DESIGN DEVELOPMENT - DESIGN PROPOSAL

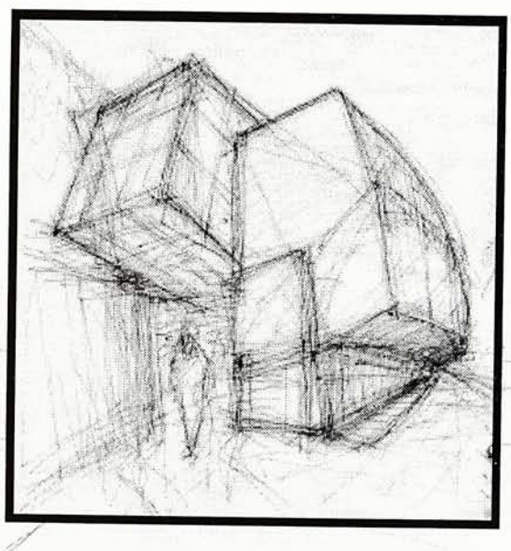
Option 2a, Section Pinup - November, 1997

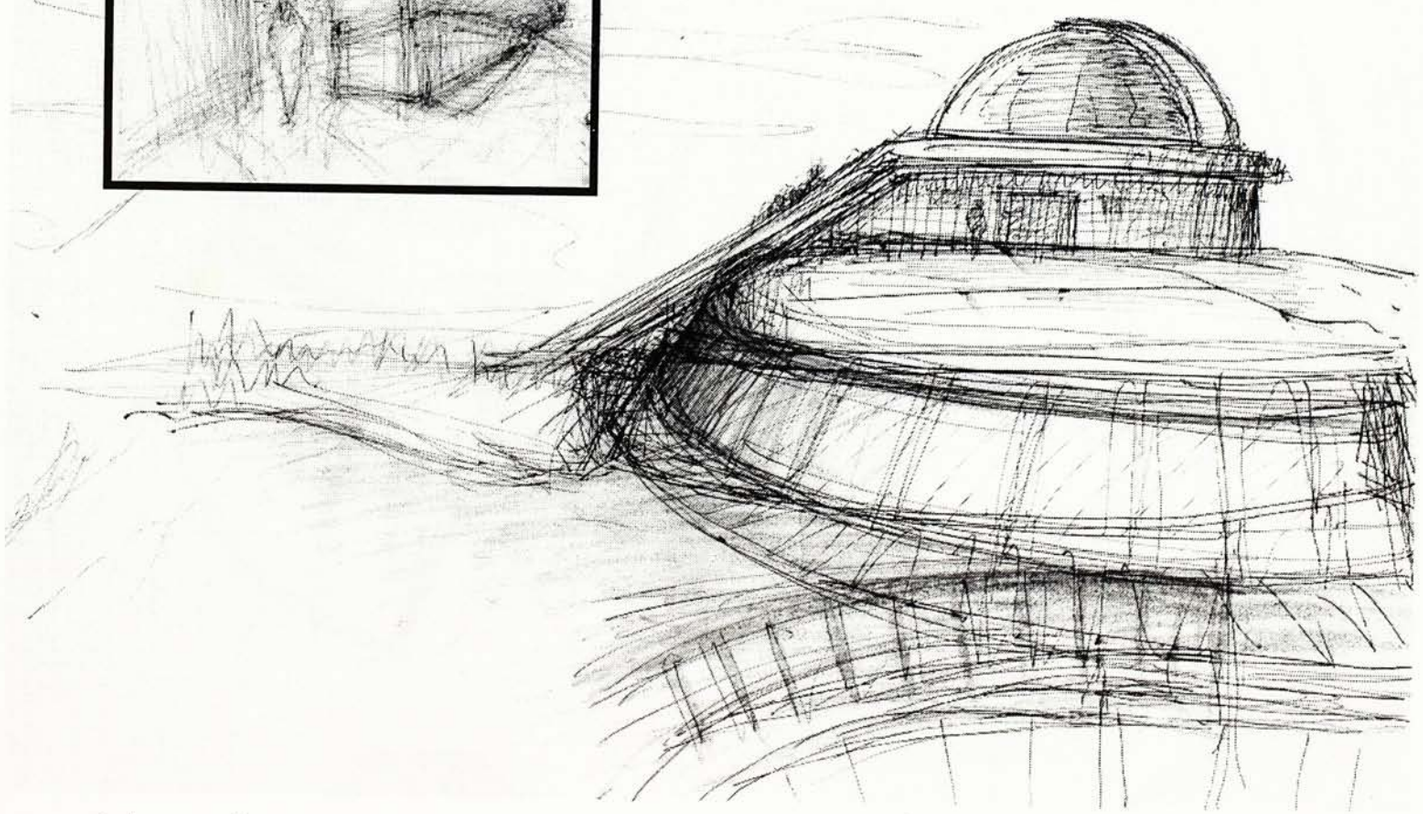
Based on option 2 overall zoning, further studies were carried out.

To make the development more sustainable in the remote island, a reservoir storing drinking water and fire services water was proposed. It was defined ed by a wall on the existing V-shape valley outside the cafeteria. As a result, it would serve both the aesthetic and functional uses.

In addition, expressions of various elements of the complex such as the observatory, entrance, were begin to be studied.







DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 2b, Section Pinup - November, 1997

In this stage, the accommodation group was moved to the north so that the three different functions works in a triangular relationship. This allowed users to access the accommodation domitories and wild camp facilities directly without passing through the exhibition areas.

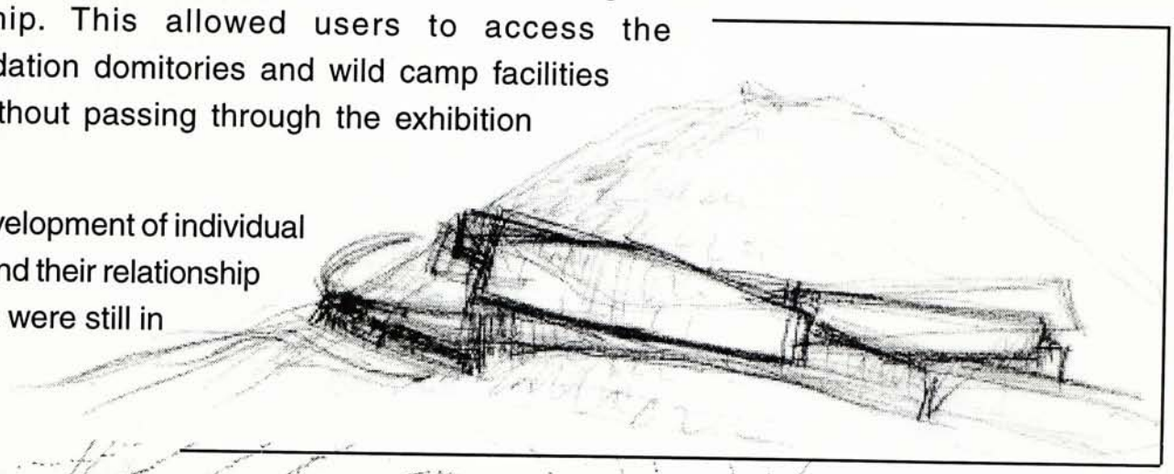
Further development of individual elements and their relationship with nature were still in progress.

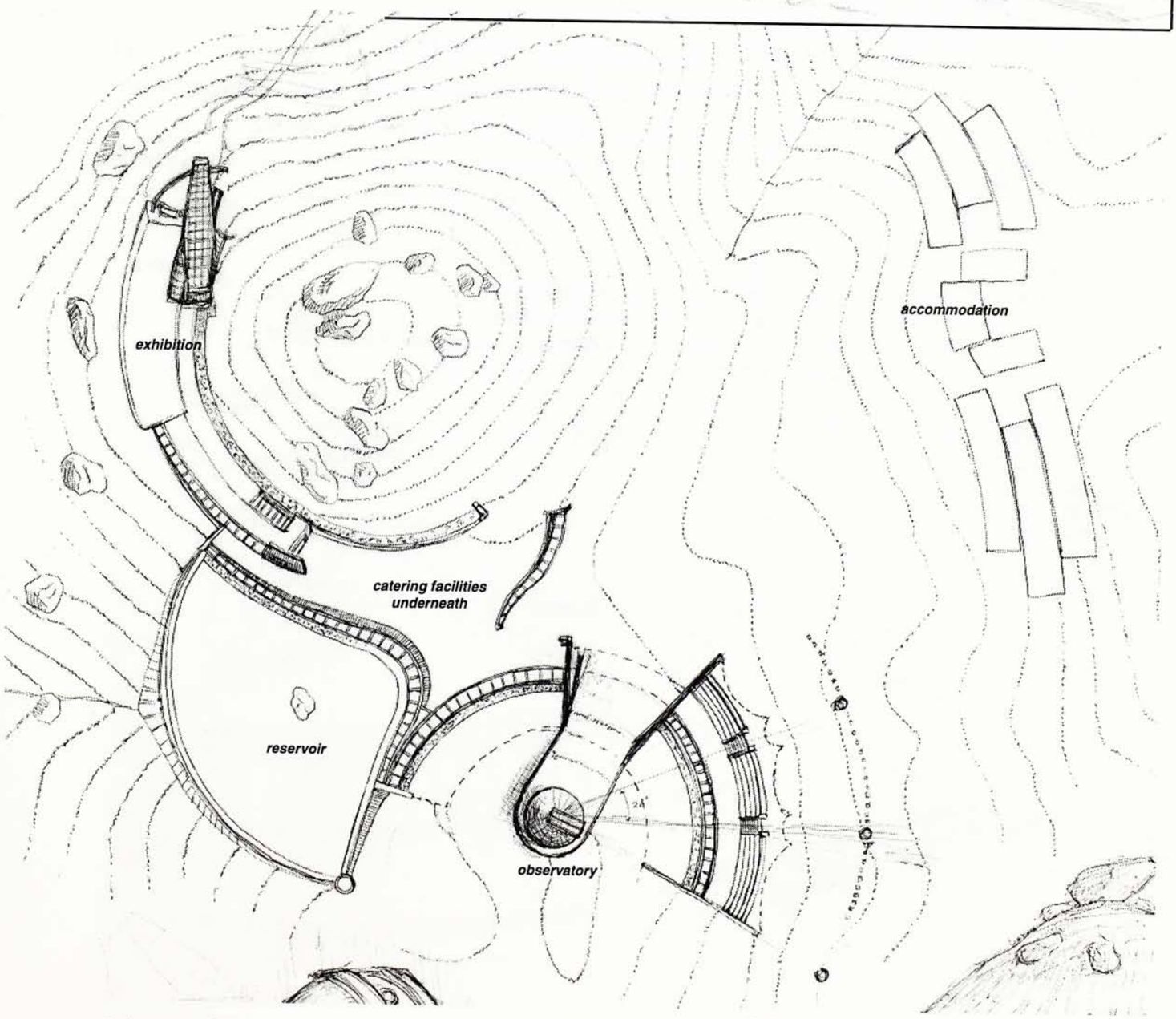
below

Entrance option w/ glass tube pointing at polaris

bottom

Site plan option 2b, 1:100





DESIGN DEVELOPMENT - DESIGN PROPOSAL

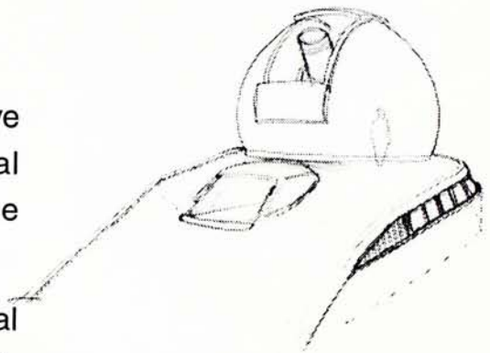
Option 2b, Element Development - November, 1997

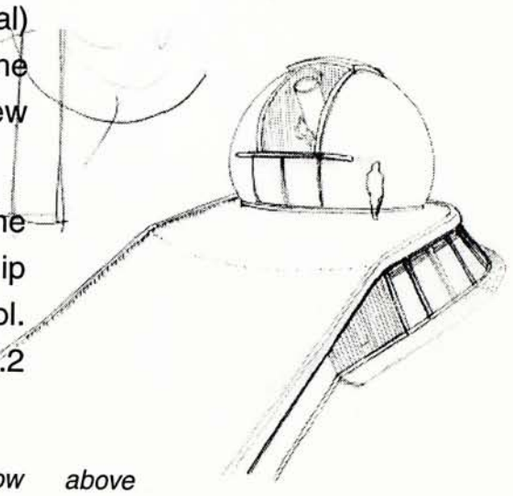
Observatory

Although the underlying philosophy for the design is to have minimum visual impact on the nature, the functional requirement of an observatory made it take a quite conventional form - a sphere.

The "point" observatory therefore marked a artificial focal point while the rock tower standed as the natural focal point. Located on an adjacent highland, its altitude (+76.5 original) was lower than that of the rock tower (+86.3). However, the far horizontal distance (about 80m) reduced the view obstructing problem.

Issues involved in this development process included the resulting relationship with landscape, functional relationship among the related spaces and the strategy of light control. Some of the concepts had been highlighted in concept 1.3.2 (p. 26) and concept 2.1.1 to 2.3.1 (p. 28).



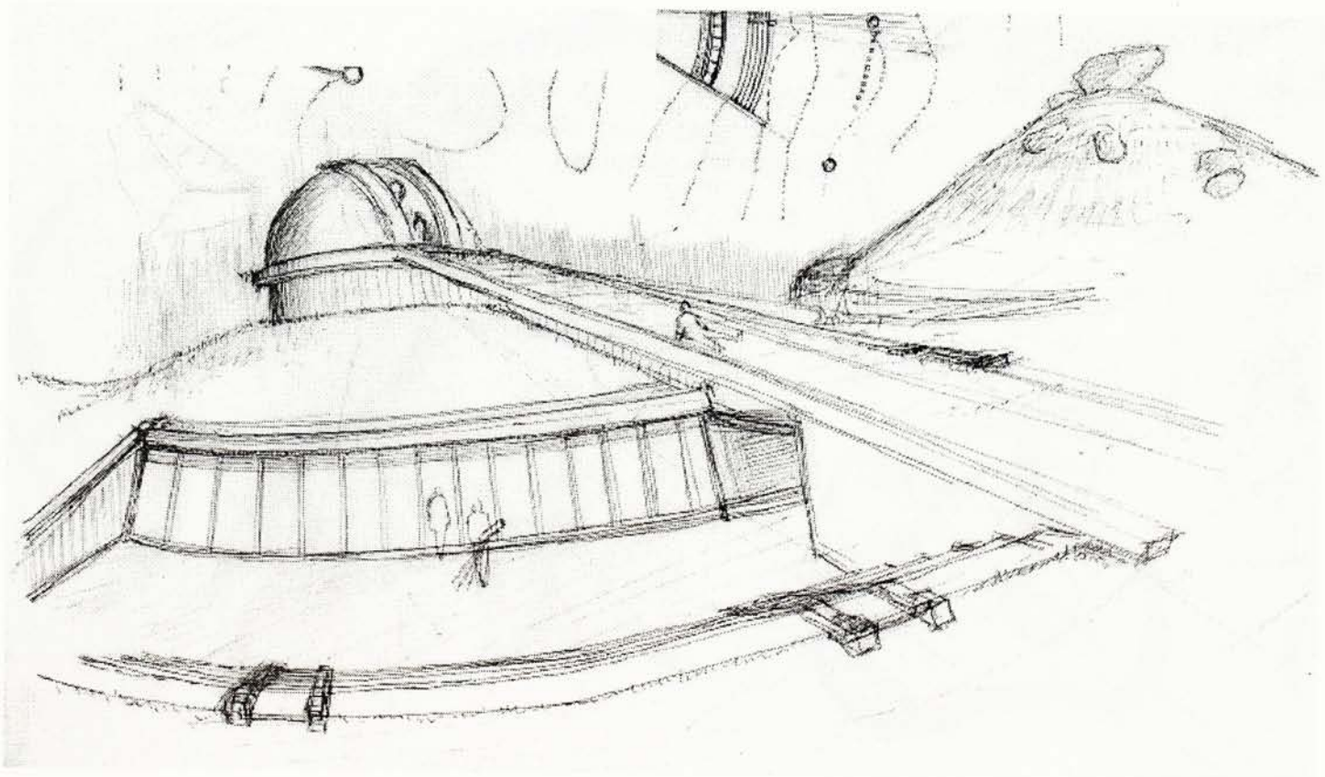


above

Options studying formal expression and natural lighting to control room below

below

Sketch perspective showing relationship between "natural landmark" & "artificial landmark" and the sunken star gazing classroom



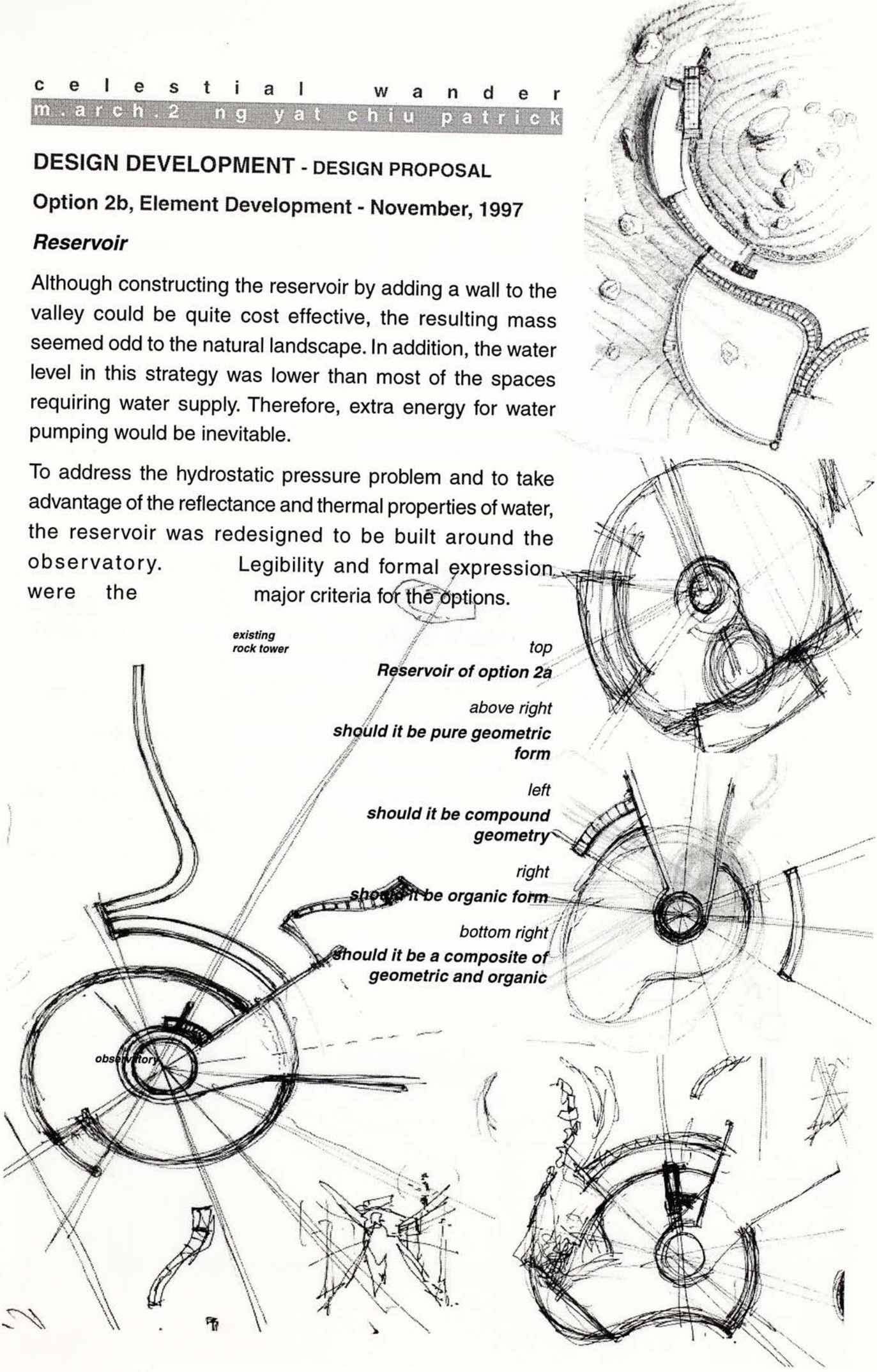
DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 2b, Element Development - November, 1997

Reservoir

Although constructing the reservoir by adding a wall to the valley could be quite cost effective, the resulting mass seemed odd to the natural landscape. In addition, the water level in this strategy was lower than most of the spaces requiring water supply. Therefore, extra energy for water pumping would be inevitable.

To address the hydrostatic pressure problem and to take advantage of the reflectance and thermal properties of water, the reservoir was redesigned to be built around the observatory. Legibility and formal expression were the major criteria for the options.



top
Reservoir of option 2a

above right
should it be pure geometric form

left
should it be compound geometry

right
should it be organic form

bottom right
should it be a composite of geometric and organic

DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 2b, Element Development - November, 1997

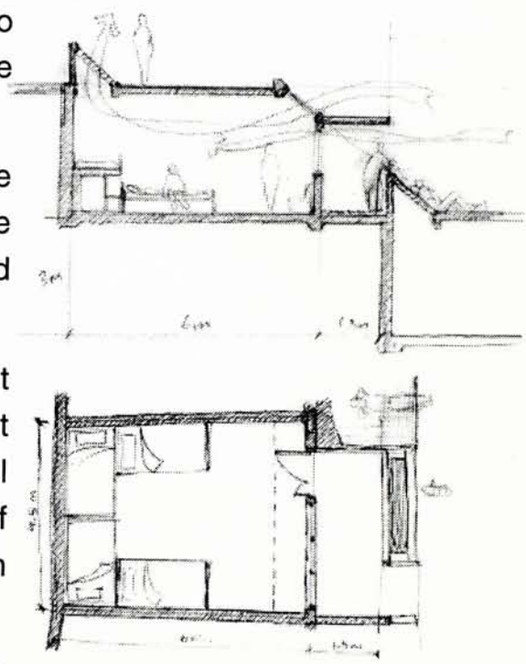
Accommodation

The accommodation modules should be simple in plan to allow high flexibility and simpler construction. However, to consider quality, designing in sections would require more efforts.

To enhance people enjoying nature, the modules were designed to integrate into natural landscape and to provide various external characters of spaces for users. They could stand, sit or lay on the grass.

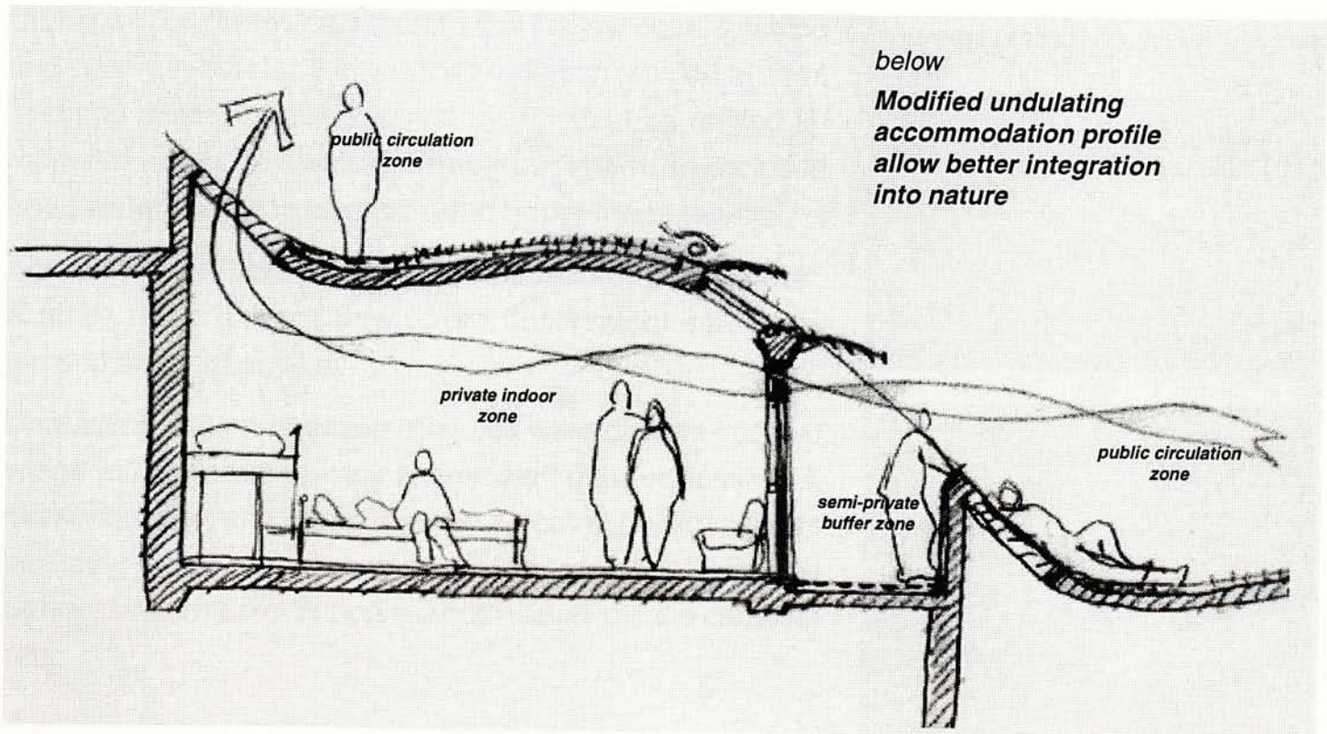
In addition, large area of front glazing together with skylight were provided. This was to allow users inside to look up at the sky while staying in bed and to have high visual connection to outside landscape. To maintain a degree of privacy, a semi-private balcony was inserted in front of each module to serve as a buffer zone.

As there is consistent eastern onshore sea breeze on the east facing slope, natural ventilation was also adopted in the modules to minimise energy consumption. As a result, devices were introduced on the back of the module where water proofing had also to be considered.



above

Section and plan showing functional relationship among different zones



below

Modified undulating accommodation profile allow better integration into nature

DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 3, Second Review - 28, November 1997

Developed from option 2, **zonings** of the development were divided into *day time functions* on the western slope and *night time functions* on the eastern slope. They were visually separated by the existing landscape, the ridge, running from the observatory to the rock tower.

Geometry of the buildings were generated either by the major *astronomical axes* or the *existing topography*. An organic curvilinear complex was then developed with several strong axes.

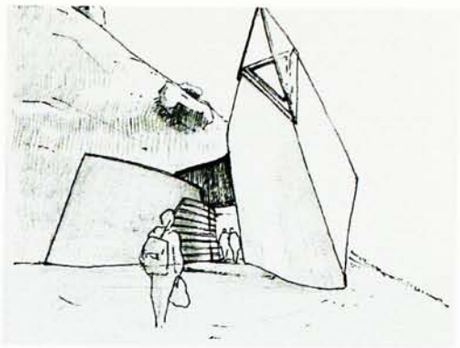
Branching out from the existing footpath was the access path to the entrance which linked directly to the double volum\e **exhibition spaces**. With natural rock surface lit by upper skylight on one side and exhibition displays on the other side, the exhibition hall gave access to the grass platform on top and cafeteria on underground level.

Sand was introduced along the interior edge of the **cafeteria** with flowing water beyond to blur the boundary between interior and exterior space. The cafeteria also served as an below grade connection between the exhibition spaces and **workshop**.

Reservoir was defined by adding a workshop to an original C-shaped landform. It supported the fire services, flushing and decorative water and reduced radiation emitted at night affecting seeing of the observatory. It would be refilled by rainwater and stream water from nearby stream. An enclosed fresh water tank was also provided under the reservoir.

Access to the **observatory** would pass through the water. A grass ramp running down from observatory served as second mean of access.

Undulating accommodation modules were divided into two wings with different privacy zones: staff quarter, families & guests quarter; and group quarter. A central public facilities including dining hall, kitchen and toilets, stood out a little bit as orientation marker supported both wings and the camping site.



To have optimal visual and physical impact on the natural environment and let a sculptural entrance embracing the rock tower.

top
Sculptural entrance resembling the rock tower

above
Accommodation group following existing topography; site plan 1:1000

below
Model photo showing the "natural" and "artificial" landmark

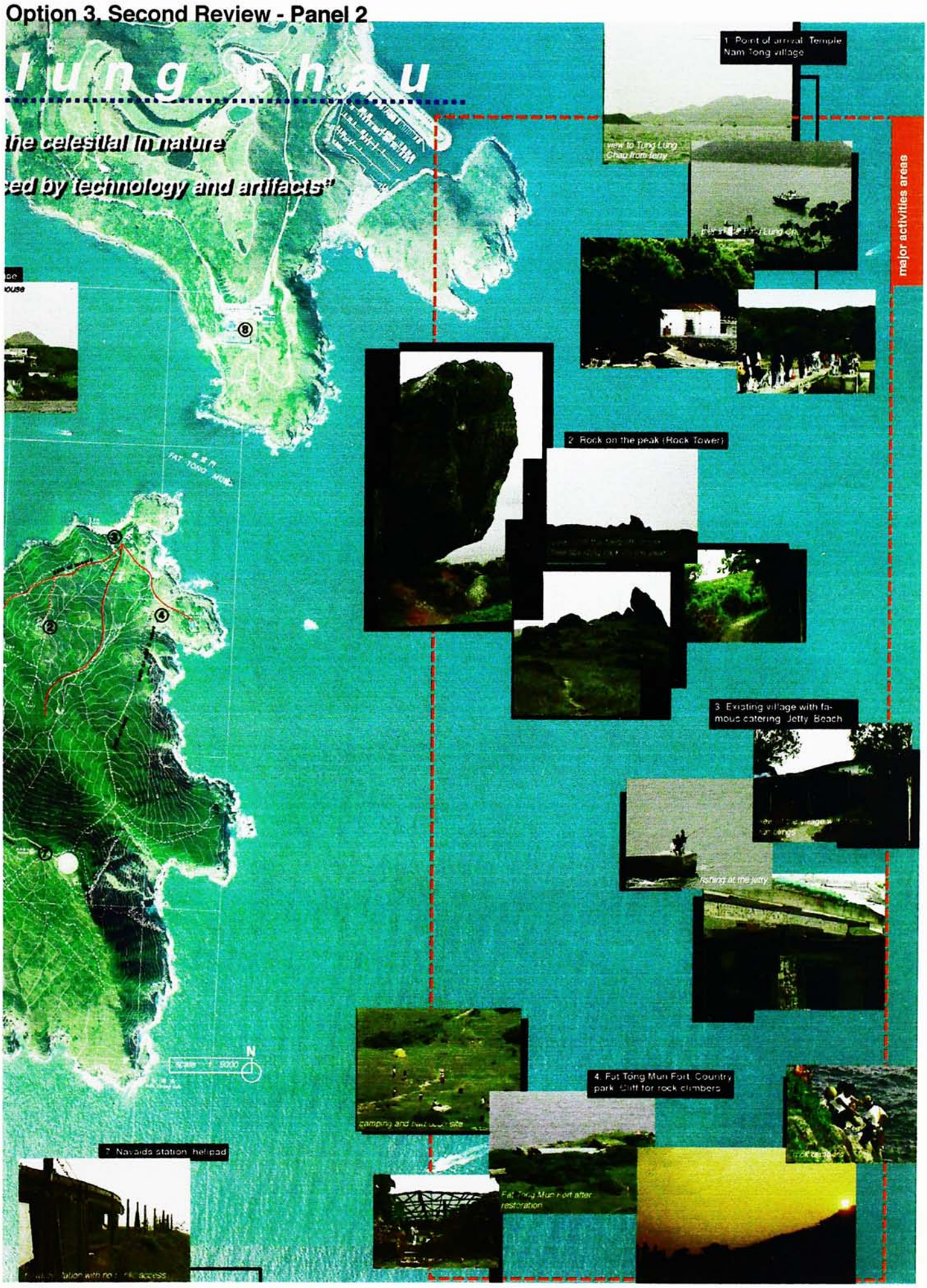
bottom
Working in progress

DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 3. Second Review - Panel 1

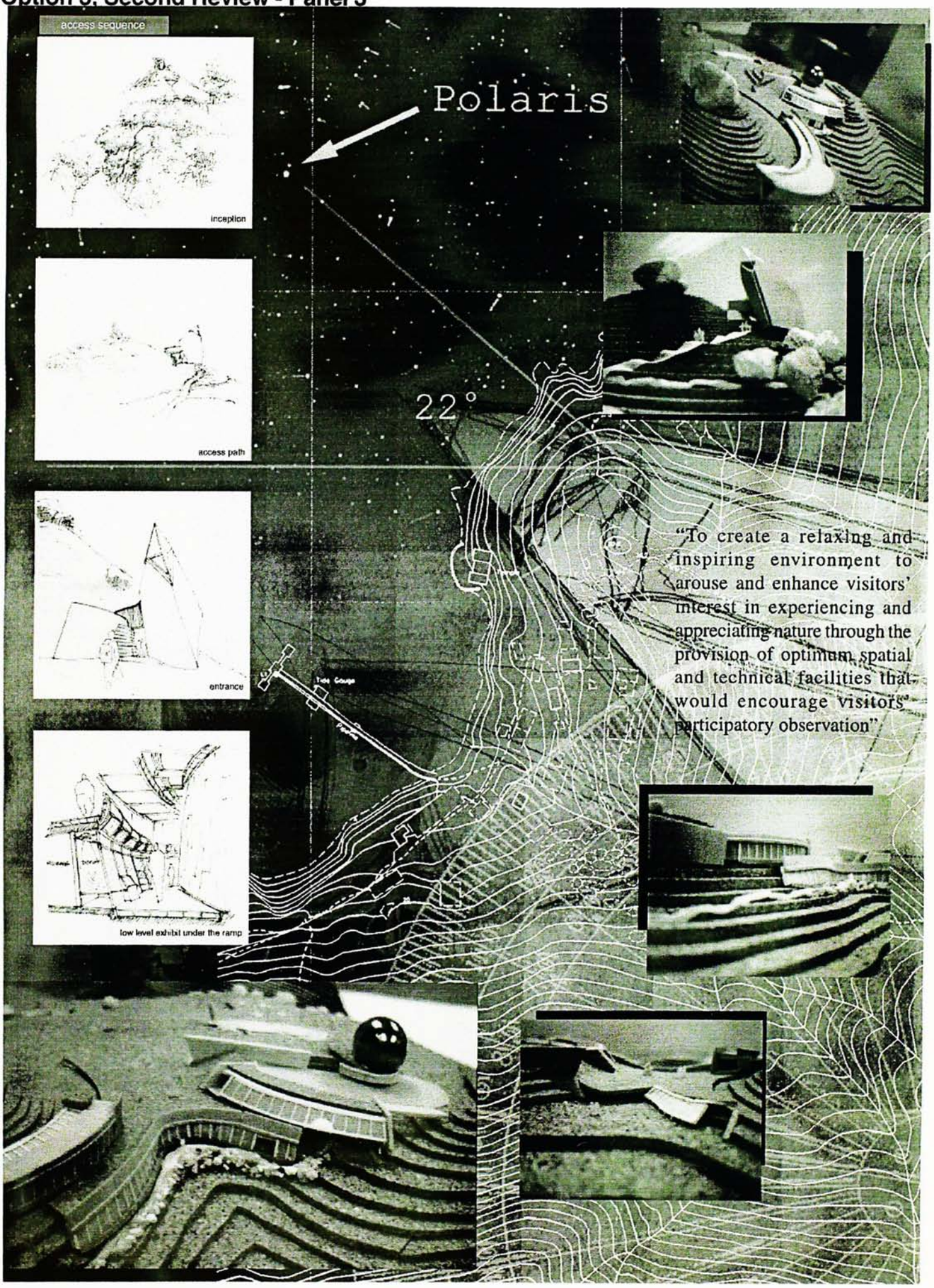
DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 3, Second Review - Panel 2



DESIGN DEVELOPMENT - DESIGN PROPOSAL

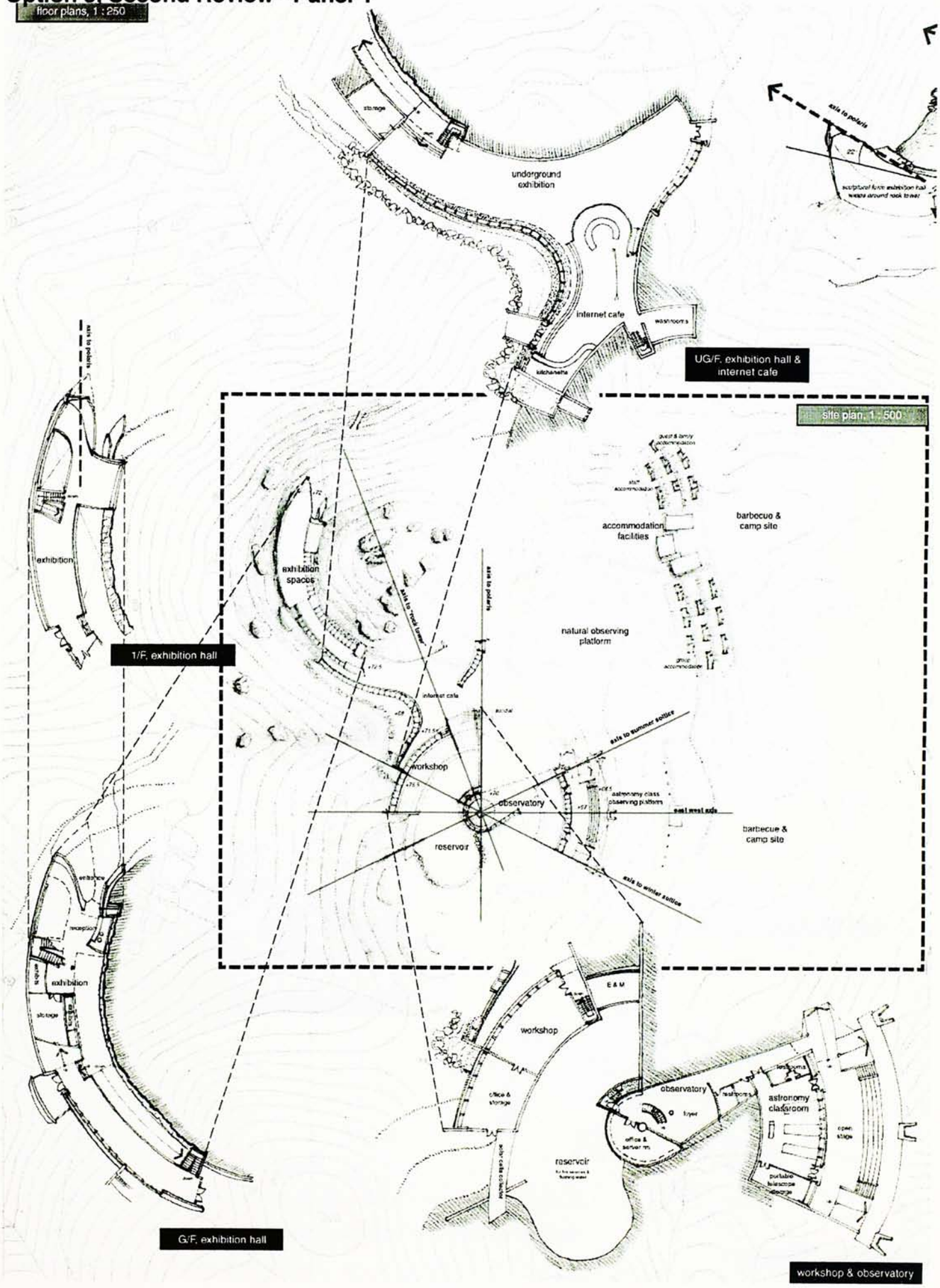
Option 3, Second Review - Panel 3



DESIGN DEVELOPMENT - DESIGN PROPOSAL

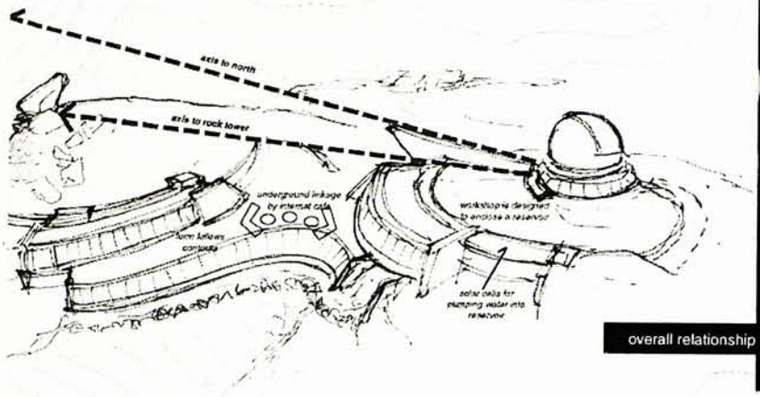
Option 3, Second Review - Panel 4

floor plans, 1 : 250

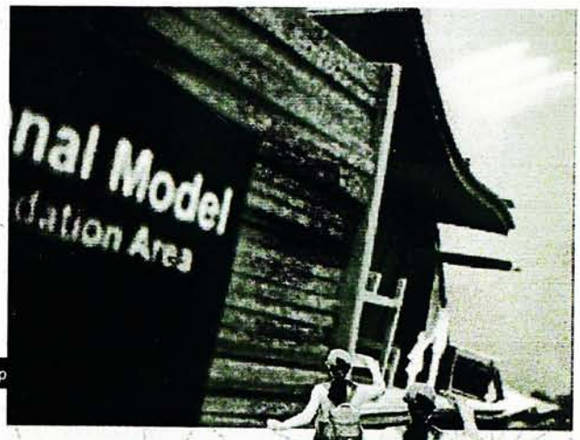


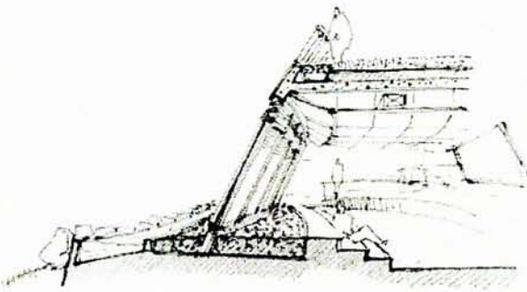
DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 3, Second Review - Panel 5

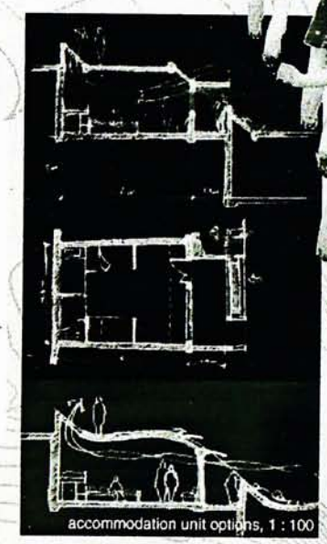


overall relationship

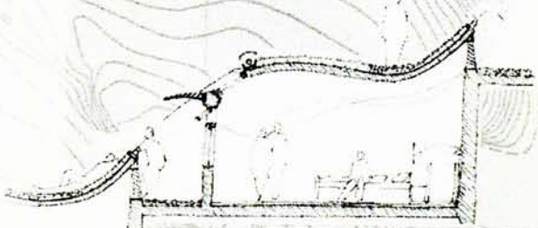




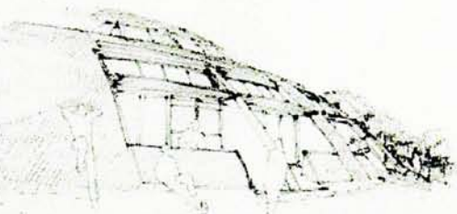
intenet cafe



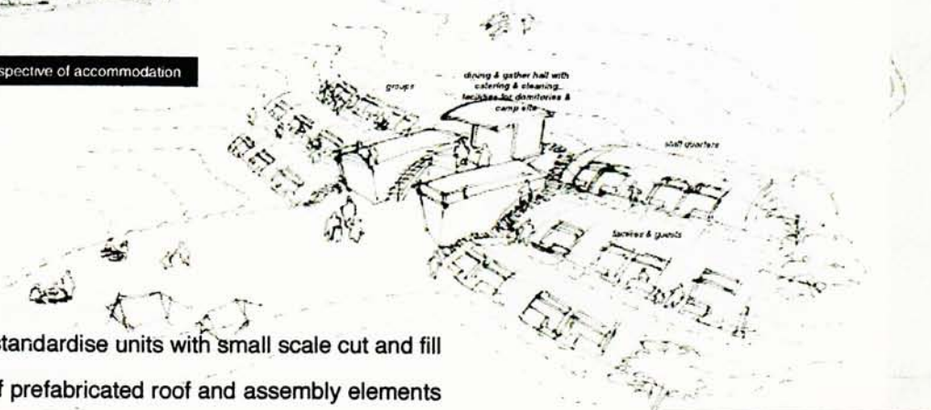
accommodation unit options, 1 : 100



typical accommodation unit section, 1 : 50



exterior perspective of accommodation



accommodation modules & camp site

The accommodation modules were standardise units with small scale cut and fill site formation work and composed of prefabricated roof and assembly elements to allow simple onsite construction work.

Option 3, Second Review - Volumetrics

Museum

- check-in counter — *21 m²*
- Museum of Space Science & Modern Astronomy (indoor & outdoor) — *1,300 m²*
- Museum of Ancient Myths (underground) — *900 m²*
- cyber cafe with 60 seatings, workstation x 25 and projection screen — *200 m²*
- cyber cafe pantry — *25 m²*
- exhibit storage — *250 m²*
- general storage — *100 m²*
- restroom — *25 m²*

Workshop

- main studio with wireless network with projection screen — *120 m²*
- production studio x 2 — *@30 m²*
- computer server room — *20 m²*
- open plan office — *60 m²*
- general storage — *30 m²*
- staff restroom — *8 m²*

Observatory

- 40-inch computer controlled astronomical telescope in separate structure observatory — *50 m²*
- waiting area — *60 m²*
- computer laboratory for observatory — *24 m²*
- portable telescopes storage — *30 m²*
- classrom with portable computer x 20 and indoor wireless network — *150 m²*
- outdoor observing platform with wireless network for constellation observation class and portable telescope observation (outdoor) — *150 m²*
- general storage — *15 m²*
- restroom — *40 m²*

Accommodation

- group module w/ 8 beds x 10 — *@44 m²*
- family module w/ 4 beds x 4 — *@24 m²*
- couple module / guest room w/ 2 beds x 4 — *@24 m²*
- staff module w/ 2 beds + toilet x 2 — *@32 m²*
- wild camp site & barbecue site (outdoor)
- common room / dining room — *35 m²*
- kitchen — *25 m²*
- bathroom w/ toilets: male + female — *35 m²*
- laundry — *15 m²*
- storage — *15 m²*

Supporting Utilities

- small reservoir for fire services system and flushing water
- water tank w/ 1 week fresh water storage and water pump
- transformer room and backup electricity generator room
- solar energy receiver
- AHU rooms

Feedback

The comments on the philosophy were quite extreme. One party agreed on respecting the natural landscape while the other party assumed architecture preserve more expressive characters.

Besides, some comments suggested further exploration into the **cosmological** and **mythical** part of man might allow a deeper interpretation.

Expansion of program as a result might allow more interesting solution. In addition, understanding of various **natural elements** could be developed and to be reinterpreted into architectural solution.

Furthermore, the relationship among exhibition element, rock tower and observatory still had conflicts against the underlying design philosophy.

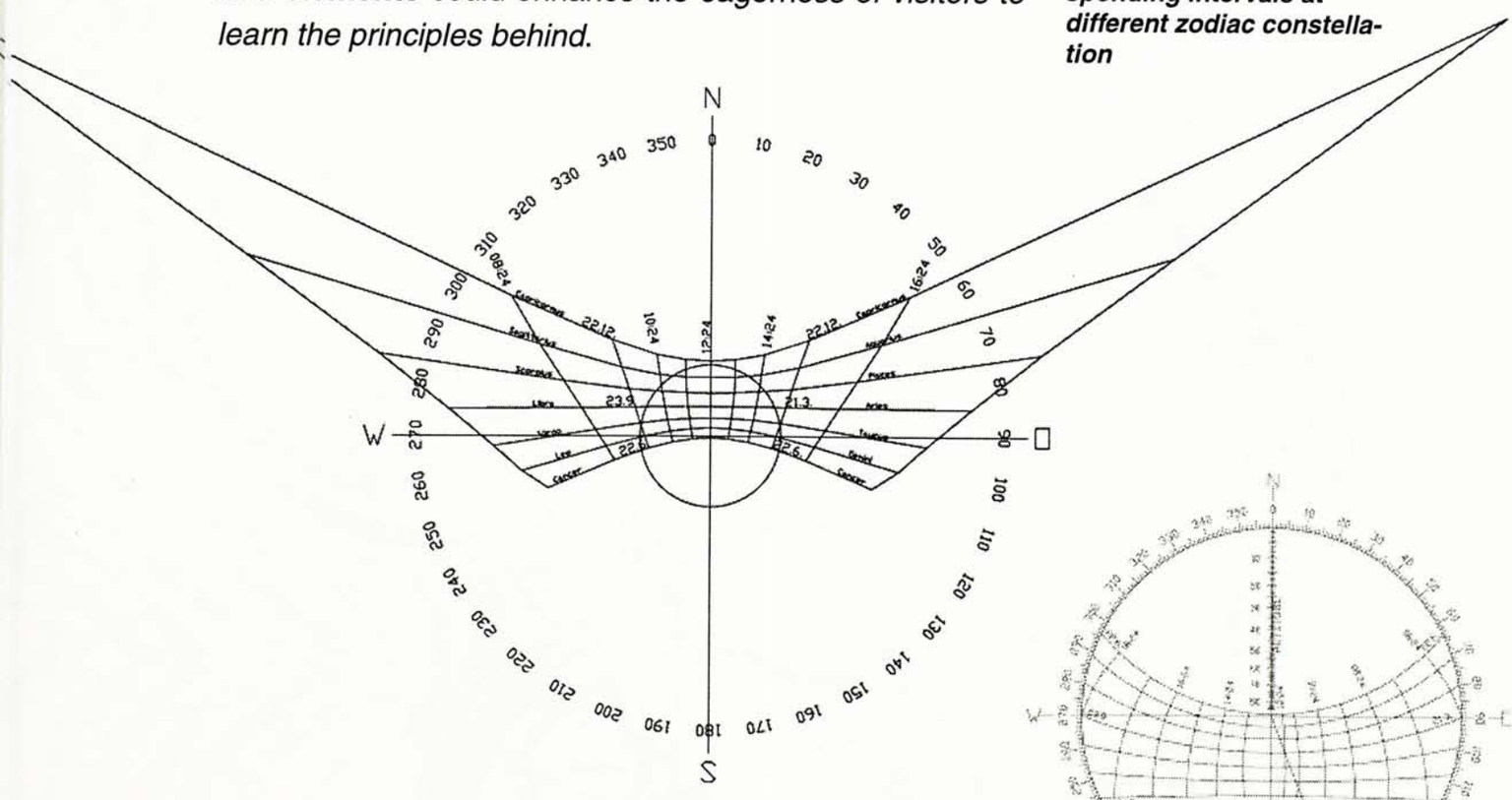
End of first term

DESIGN DEVELOPMENT - DESIGN PROPOSAL

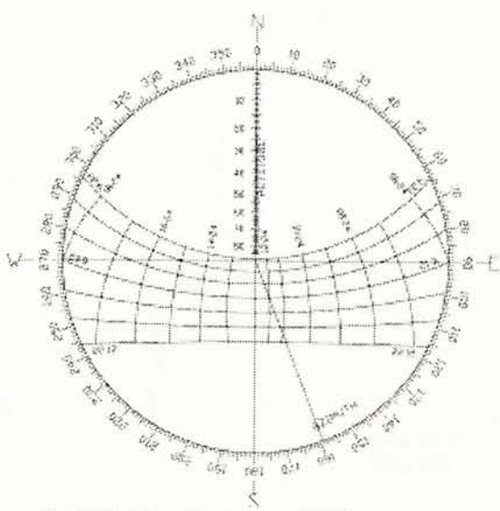
Option 4, Section Pinup - January 1998

After the Second Review, the general site zoning layout was almost fixed. However, recognising the difficulties in achieving and controlling minimal physical impact during construction, the final **visual impact and intervention** on the existing landscape was more emphasized.

At the same time, studies in different phenomena of various natural elements were carried out. The objective was to integrate the elements' properties into the overall planning and architectural design. As a result, the final outcome was not just spaces accommodating exhibits or serving just the functional requirements, but spaces interpreted by the **natural elements** or **celestial phenomena**. Achieving these could give rise to an unique, site and function specific architecture while at the same time, the **expressive spaces and elements** could *enhance the eagerness of visitors to learn the principles behind.*



Sundial derived from the Solar path diagram for Hong Kong with corresponding intervals at different zodiac constellation



Solar path diagram of HK with axis marking sun's position on equinox noon

Sun is the most important celestial body to us, all our energy primarily come from she. For years, scientists and astronomers had been spending tremendous efforts on studying her behaviours. Consequently, she would be a key element for study and reinterpretation.

DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 4, Section Pinup - January 1998

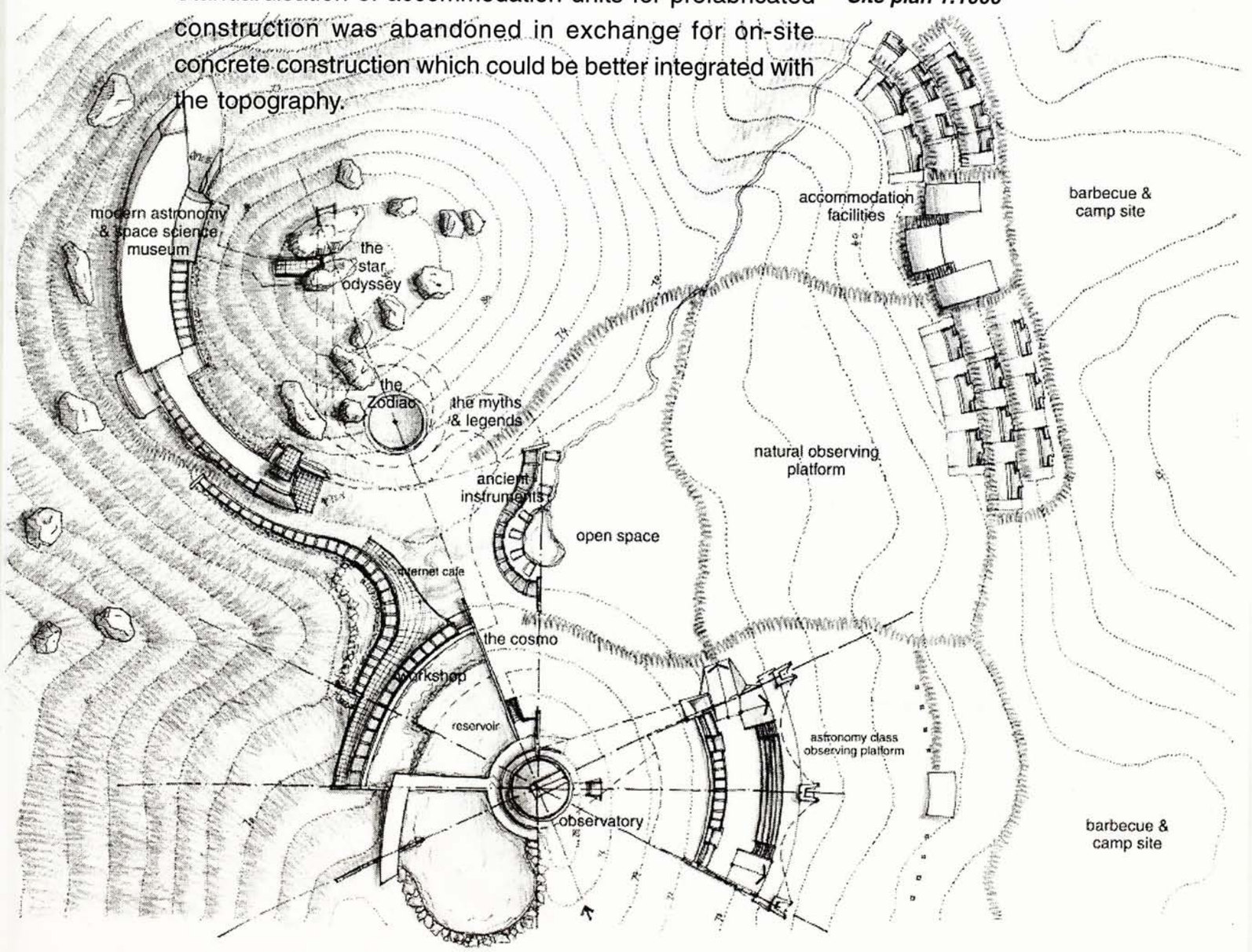
Site planning

Keeping the original site planning strategy, the external treatment was kept mostly the same. The additional elements of ancient astronomical museum were mainly put underground with only fragments extruding out.

Artificial stream originally running along the western slope, intersecting the entrance path was rerouted to pass through internal space from west and out to exterior open space again on the east. It was then discharged along the valley beside the accommodation.

Standardisation of accommodation units for prefabricated construction was abandoned in exchange for on-site concrete construction which could be better integrated with the topography.

Site plan 1:1000



DESIGN DEVELOPMENT - DESIGN PROPOSAL

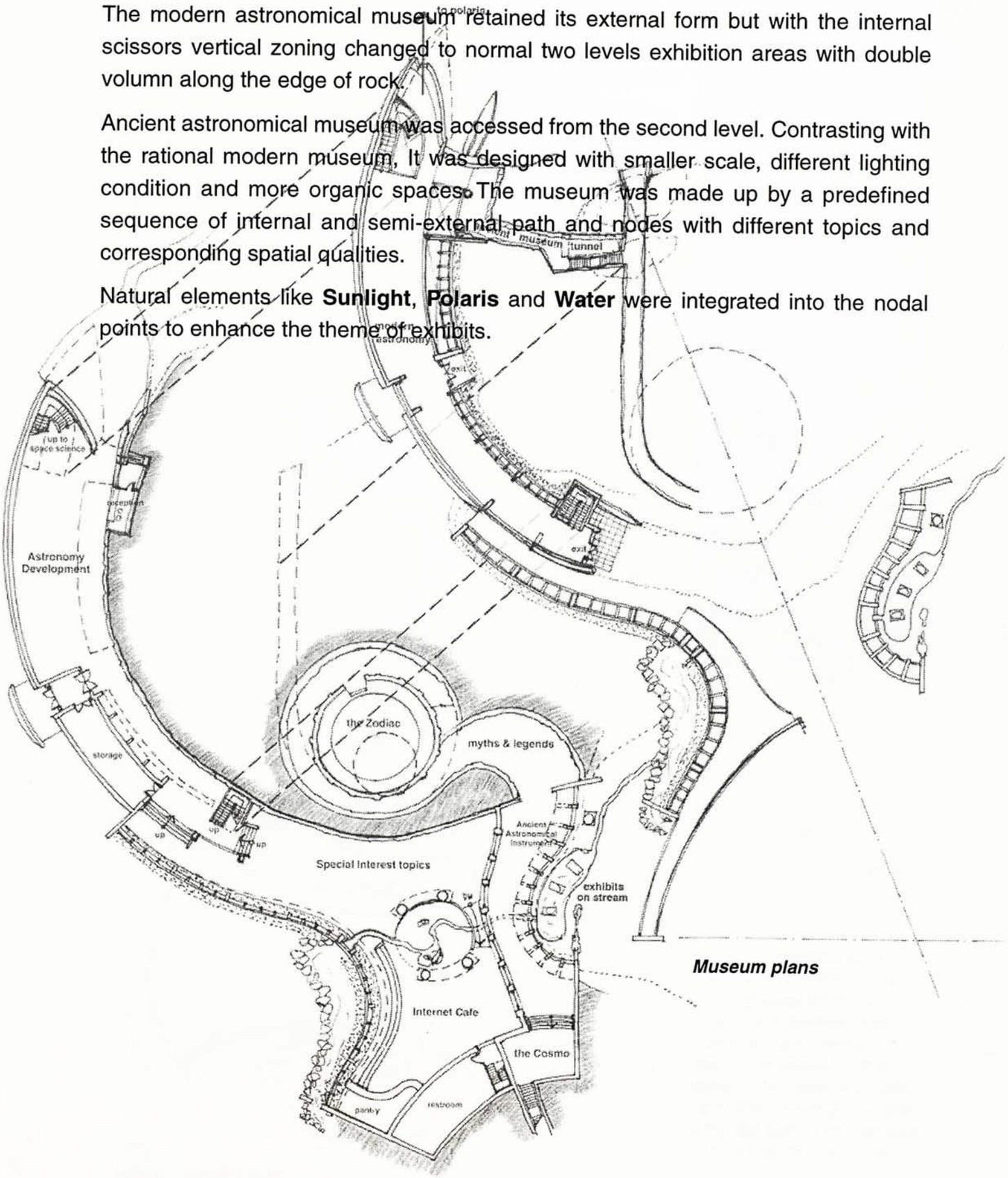
Option 4, Section Pinup - January 1998

Museums & Cafeteria

The modern astronomical museum retained its external form but with the internal scissors vertical zoning changed to normal two levels exhibition areas with double volumn along the edge of rock.

Ancient astronomical museum was accessed from the second level. Contrasting with the rational modern museum, It was designed with smaller scale, different lighting condition and more organic spaces. The museum was made up by a predefined sequence of internal and semi-external path and nodes with different topics and corresponding spatial qualities.

Natural elements like **Sunlight**, **Polaris** and **Water** were integrated into the nodal points to enhance the theme of exhibits.



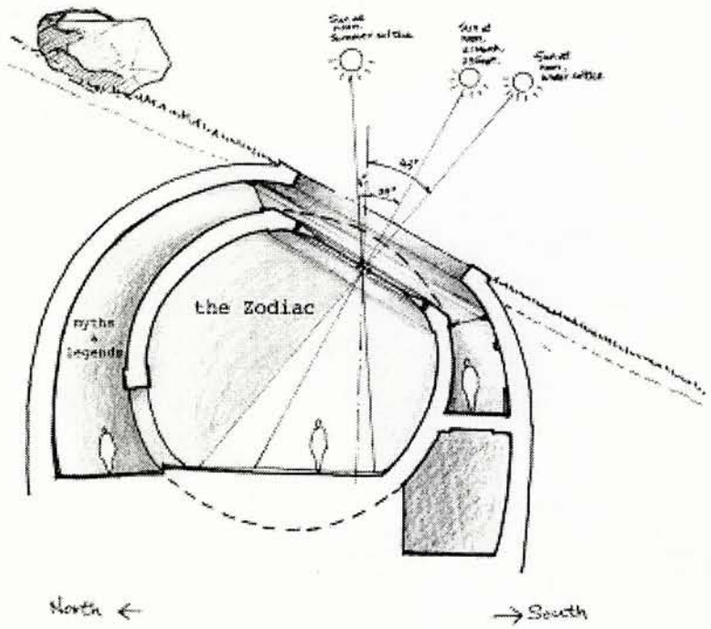
Museum plans

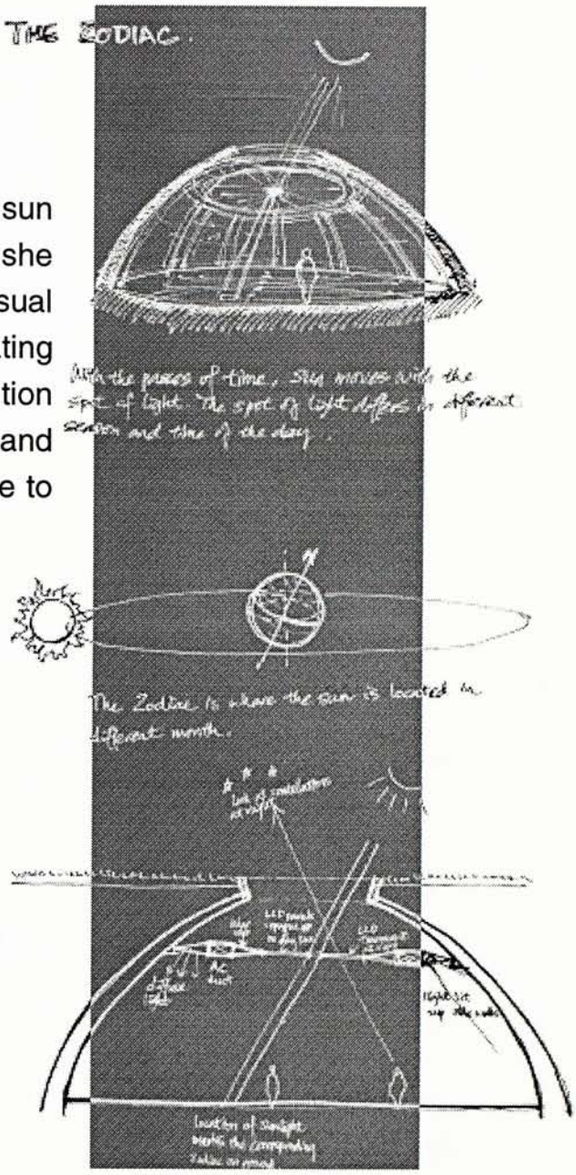
DESIGN DEVELOPMENT - DESIGN PROPOSAL

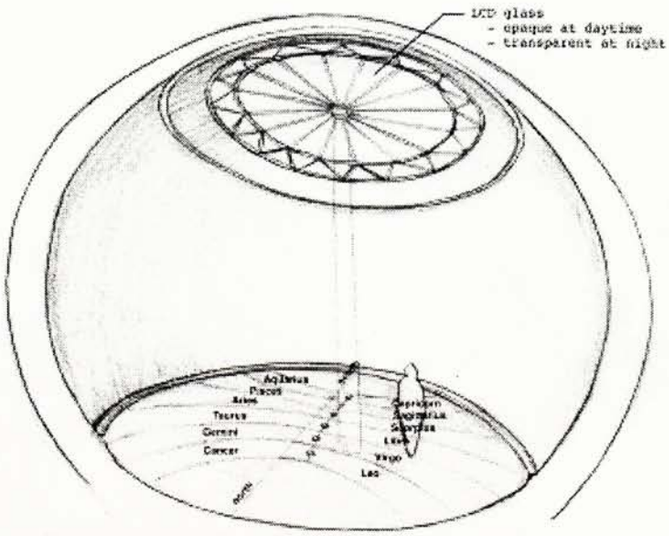
Option 4, Section Pinup - January 1998

Zodiac

Taking Hong Kong as a reference point, the position of sun moves in the East West direction during a day; while she migrates in the South North direction in a year. This visual superficial observation results from the tilted self rotating Earth revolving around the Sun. These changes in position also contibuted to the ancient development of astrology and the formation of zodiac as situation of Sun was believe to affect every person's characters and fate.







the Zodiac

above

Concepts of capturing sun's position and projecting it on ground and interprete from it the current zodiac constellation

left

Potential architectural resolution for the zodiac. Recognising from the solar path diagram that sun always shines from the south except a few days in summer, and also to fit the existing topography, the ball of zodiac was rotated southwards as shown.

DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 4, Section Pinup - January 1998

Star Odyssey

It was the first episode to be encountered in the ancient museum. Following through an intimate, rock surfacing tunnel experienced nodal points reconstructing the ancient thought relating to stars. Star atlas rock carve had skylight on top revealing part of the mysterious rock tower. Climbing up another flight of stair was the tube pointing straight at Polaris with the view of navigating vessels: recalling the stars as the only navigation tool in ancient time.

Sketch perspective showing layers of spaces in Star odyssey

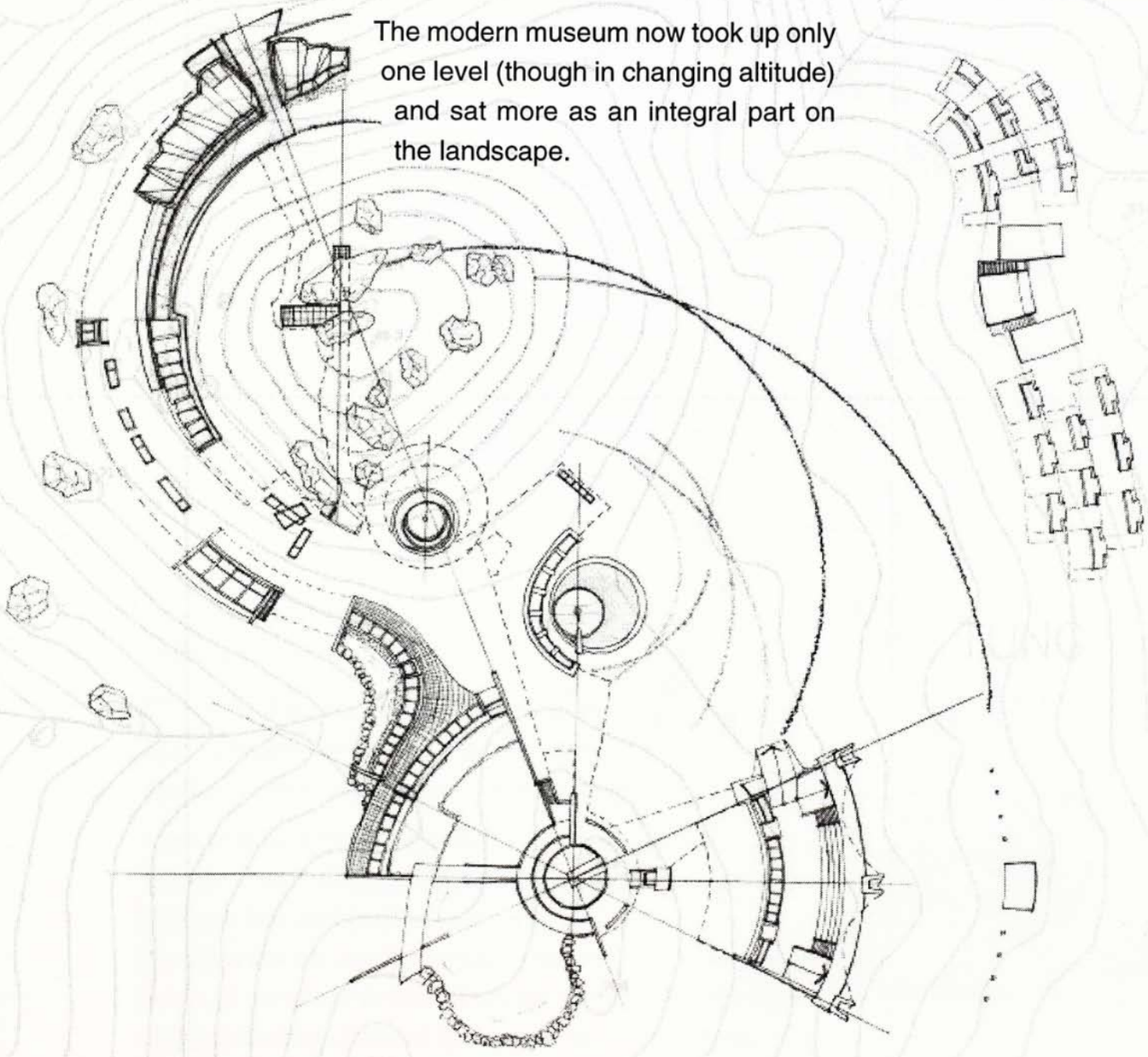
DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 5, Section Pinup - February 1998

Development of the scheme continued. Major modification was the entrance and the modern museum as that in previous scheme was found alien in the landscape in terms of scale and form.

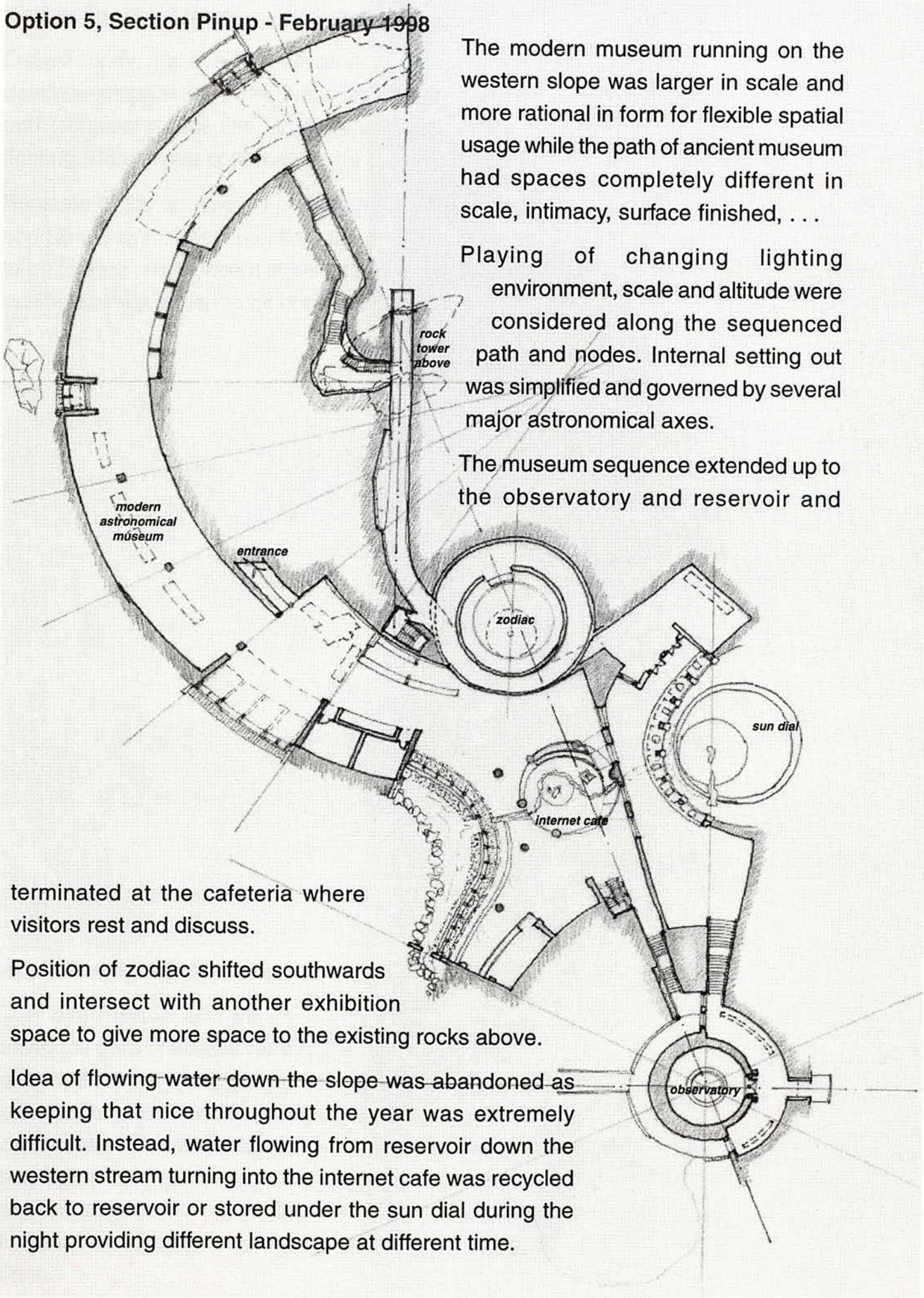
The entrance became less stand out but comprises a series of experience and views relating to the natural landmark, "rock tower". Two "crystal rocks" were placed on the landscape framing the entrance path and also the view to the "rock tower" followed by a gentle ramping path leading into the landscape.

The modern museum now took up only one level (though in changing altitude) and sat more as an integral part on the landscape.



DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 5, Section Pinup - February 1998



The modern museum running on the western slope was larger in scale and more rational in form for flexible spatial usage while the path of ancient museum had spaces completely different in scale, intimacy, surface finished, . . .

Playing of changing lighting environment, scale and altitude were considered along the sequenced path and nodes. Internal setting out was simplified and governed by several major astronomical axes.

The museum sequence extended up to the observatory and reservoir and terminated at the cafeteria where visitors rest and discuss.

Position of zodiac shifted southwards and intersect with another exhibition space to give more space to the existing rocks above.

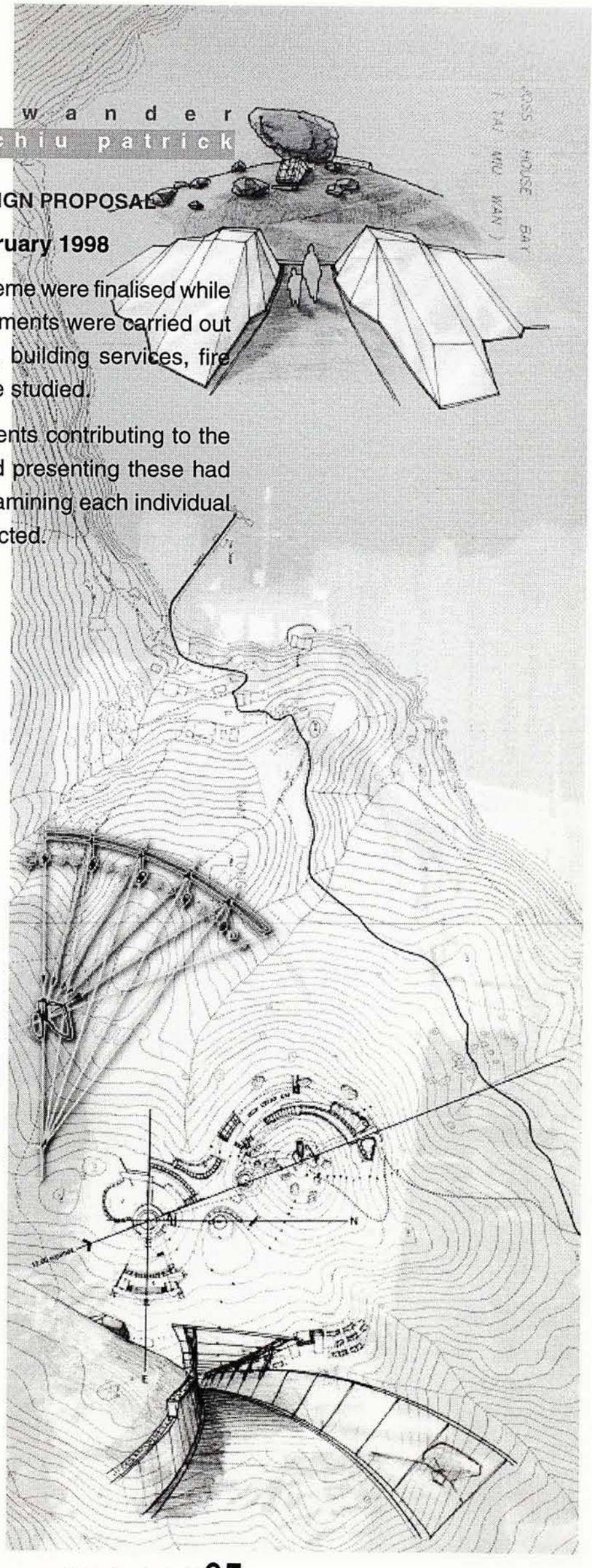
Idea of flowing water down the slope was abandoned as keeping that nice throughout the year was extremely difficult. Instead, water flowing from reservoir down the western stream turning into the internet cafe was recycled back to reservoir or stored under the sun dial during the night providing different landscape at different time.

DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 5a, Third Review - 13 February 1998

Overall zoning and design of the scheme were finalised while detail development of individual elements were carried out and technical issues like structure, building services, fire fighting issues were continued to be studied.

Because of the complexity of elements contributing to the complex, ways of documenting and presenting these had to be figured out. Concept strips examining each individual elements were began to be constructed.

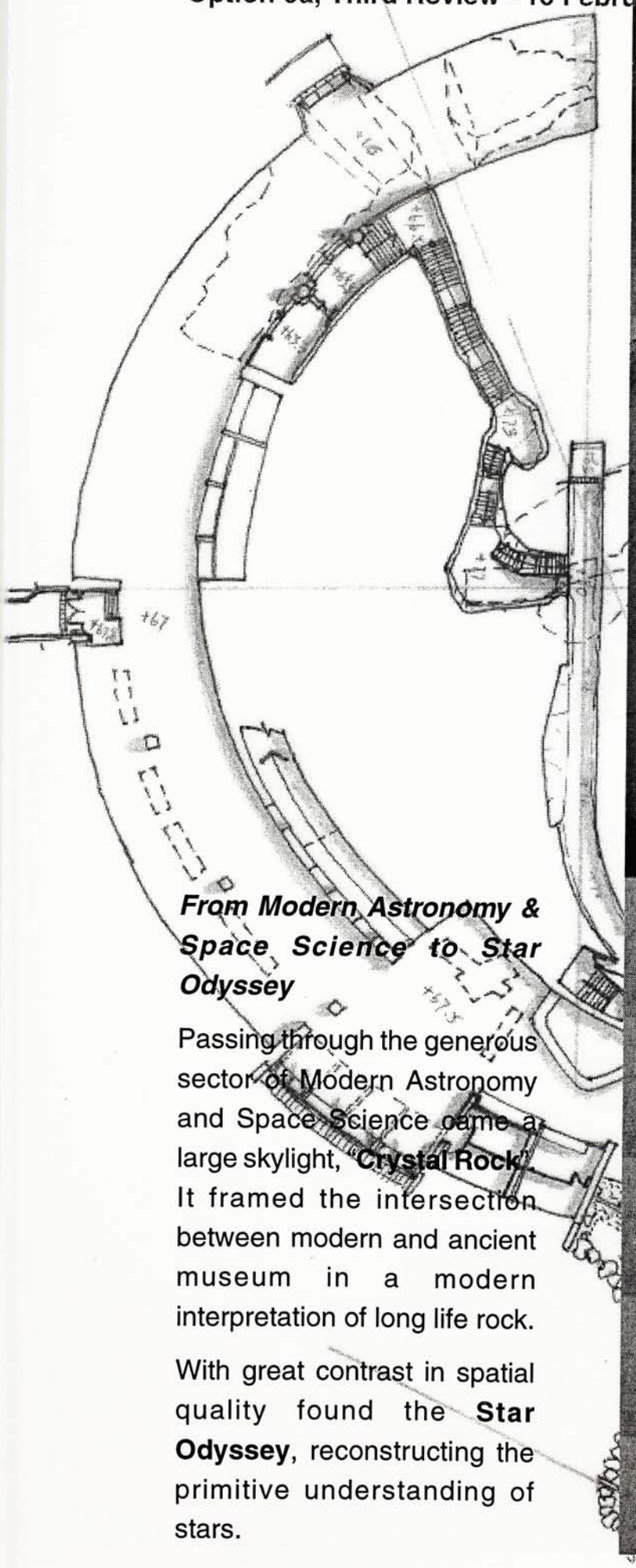


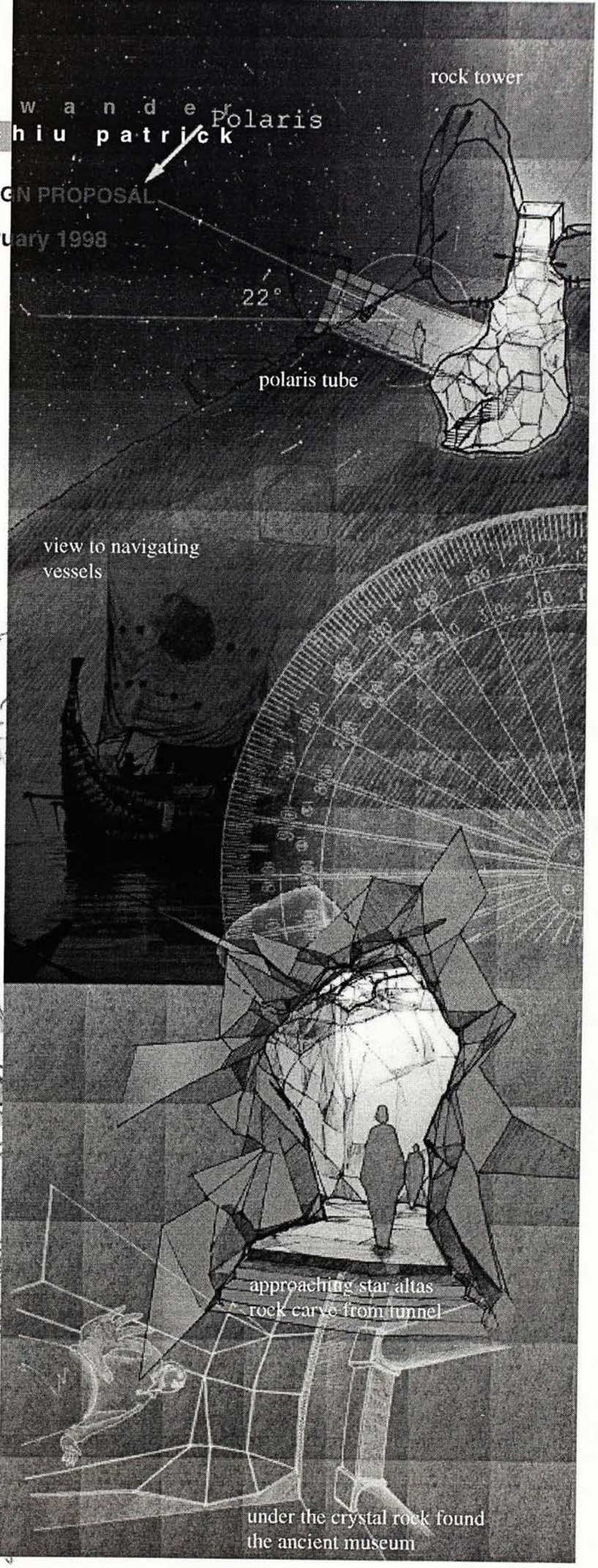
Approaching the Complex

The experience and views along the path of access were examined and manipulated around the natural landmark of **rock tower**. The entrance to the complex were not too explicit but silent with hints leading the visitors step by step.

DESIGN DEVELOPMENT - DESIGN PROPOSAL

Option 5a, Third Review - 13 February 1998

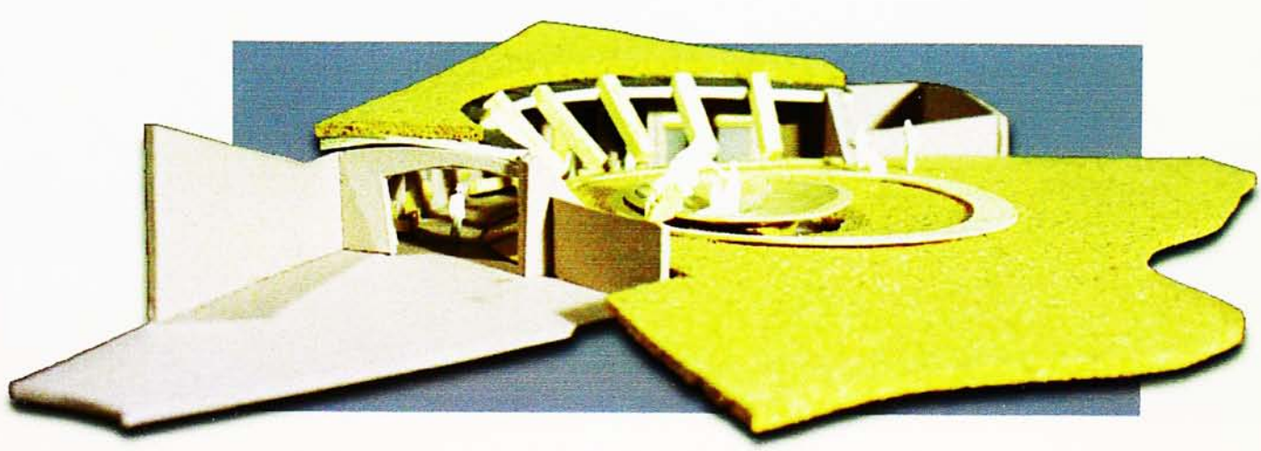




From Modern Astronomy & Space Science to Star Odyssey

Passing through the generous sector of Modern Astronomy and Space Science came a large skylight, "**Crystal Rock**". It framed the intersection between modern and ancient museum in a modern interpretation of long life rock.

With great contrast in spatial quality found the **Star Odyssey**, reconstructing the primitive understanding of stars.



SITE APPROACH - FINAL DESIGN

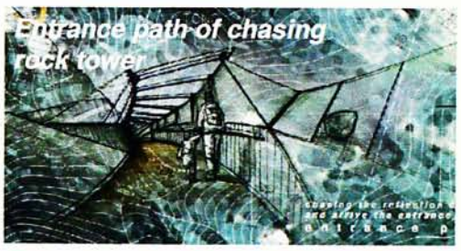
The functional objective for the development is to enhance visitors experiencing nature and celestial, and utimately developing affections for nature. As a result, the whole journey and the experience along it is considered. This is to help visitors relieving their hustle intense city life before really **experiencing nature** *in a calm and relaxing mood.*

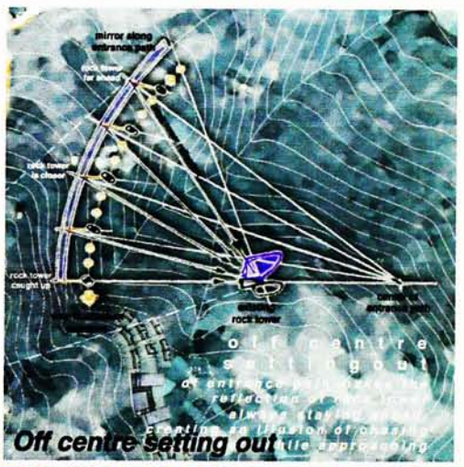
Experience along the journey

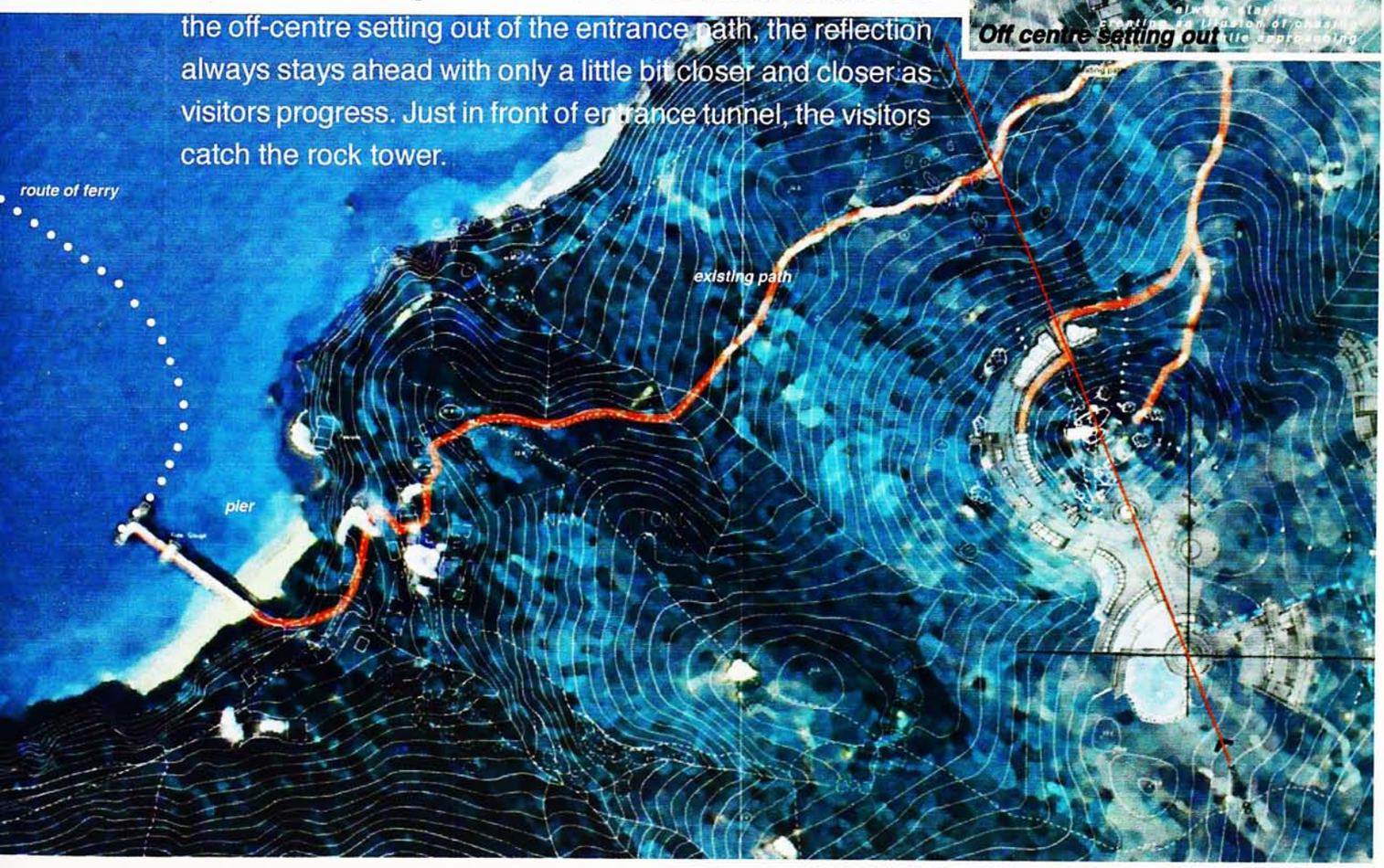
The journey starts from sailing to the island and gradually away from the city. Visitors then followed the undulating weaving path up to the complex with the guidance of mysterious "**rock tower**". The whole journey takes only a 15 minutes walk.

Turning up to the branching out access path finally find the "**crystal rock**" which forms a modern reinterpretation of rock while framing the view and access towards the rock tower.

Up a flight, visitors follow an entrance path leading to the entrance tunnel. Along the left lays the reflective side of crystal rock flowing the reflection of rock tower. Because of the off-centre setting out of the entrance path, the reflection always stays ahead with only a little bit closer and closer as visitors progress. Just in front of entrance tunnel, the visitors catch the rock tower.







SITE ZONING - FINAL DESIGN

The whole development composes of three major different zonings: ***museum***, ***observatory*** and ***accommodation***. They are interrelated functions but the relationships are not so immediate.

Day & Night Functions

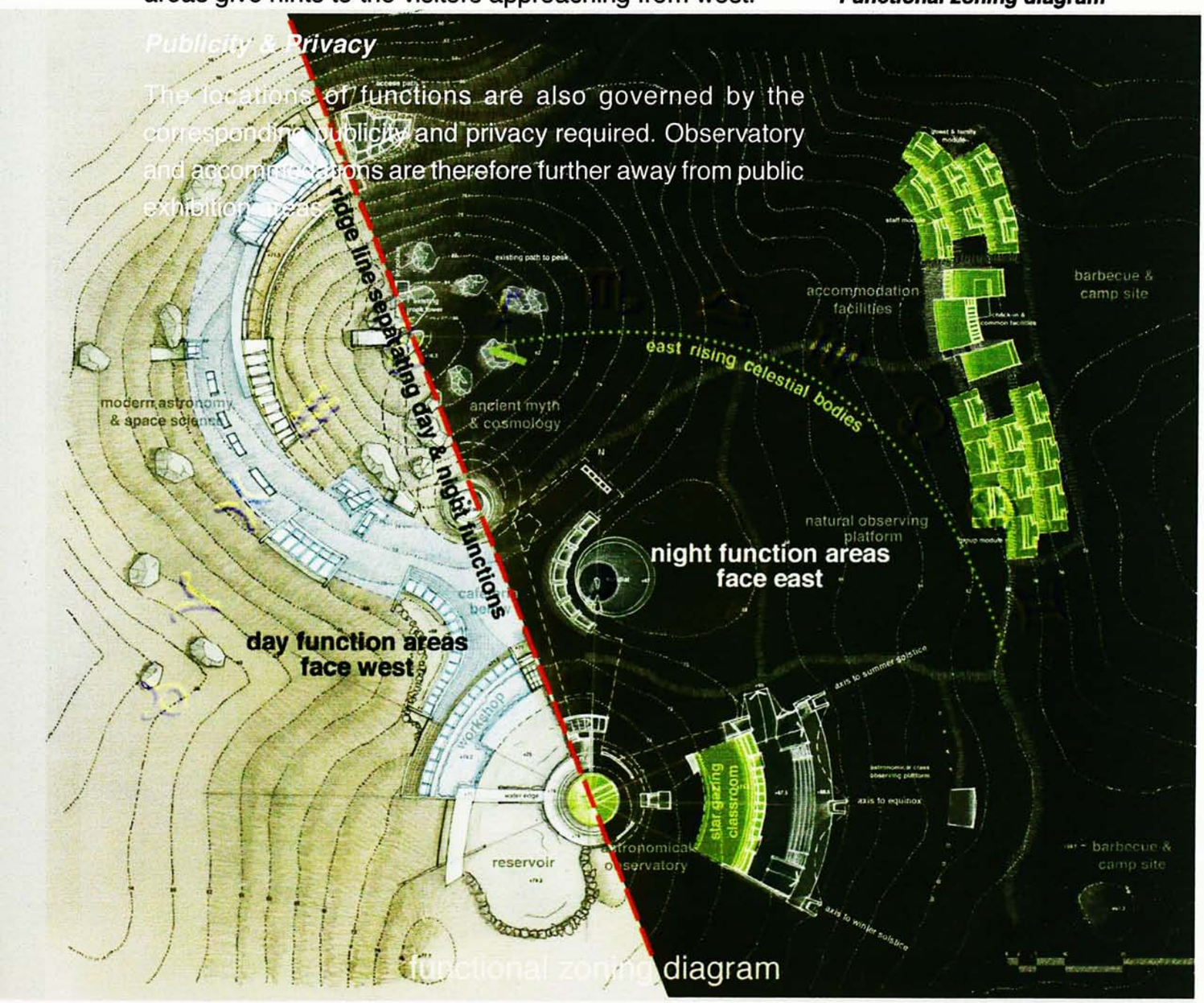
To meet the functional requirements and to minimise adverse effects especially the light pollution among them, the three zones are separated into day and night time functions sitting on the western and eastern slopes respectively.

The night time functional areas have eastern view of rising celestial bodies. On the other hand, the day time functional areas give hints to the visitors approaching from west.

Publicity & Privacy

The locations of functions are also governed by the corresponding publicity and privacy required. Observatory and accommodations are therefore further away from public exhibition areas.

Functional zoning diagram



SITE SETTING OUT - FINAL DESIGN

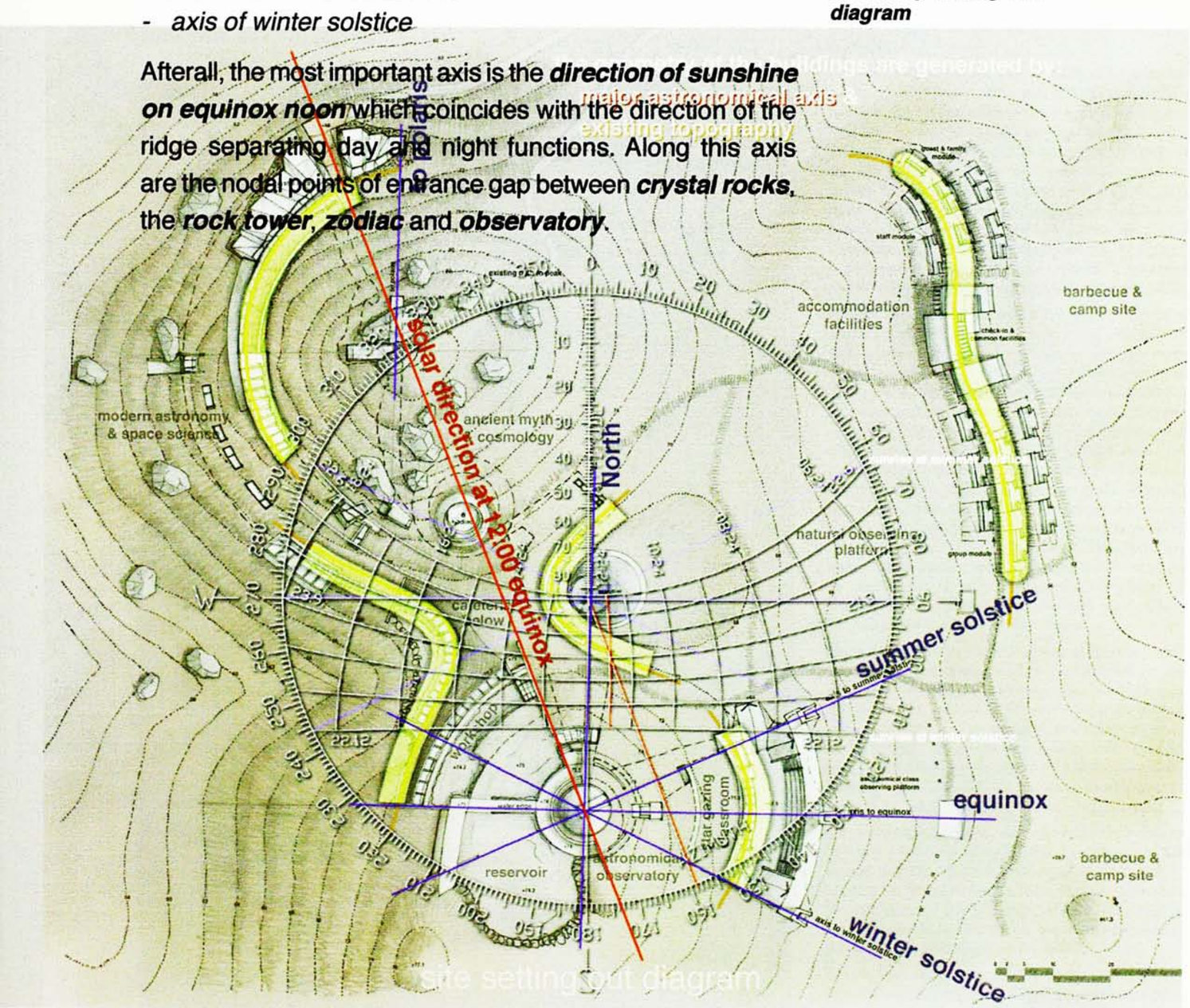
Being in an untouched natural landscape, setting out of the complex is free. To make the building better integrated into the topography and minimise cut and fill site formation work, an organic geometry ***following the contours*** is adapted. As a result, only fragments of architectural pieces are found spreading on the landscape resembling the fragments of existing rocks.

In addition, major astronomical axes are used in laying out the geometry including:

- *straight north to polaris*
- *east west axis on equinox*
- *axis of summer solstice &*
- *axis of winter solstice*

Afterall, the most important axis is the ***direction of sunshine on equinox noon*** which coincides with the direction of the ridge separating day and night functions. Along this axis are the nodal points of entrance gap between ***crystal rocks***, the ***rock tower***, ***zodiac*** and ***observatory***.

Geometry setting out diagram

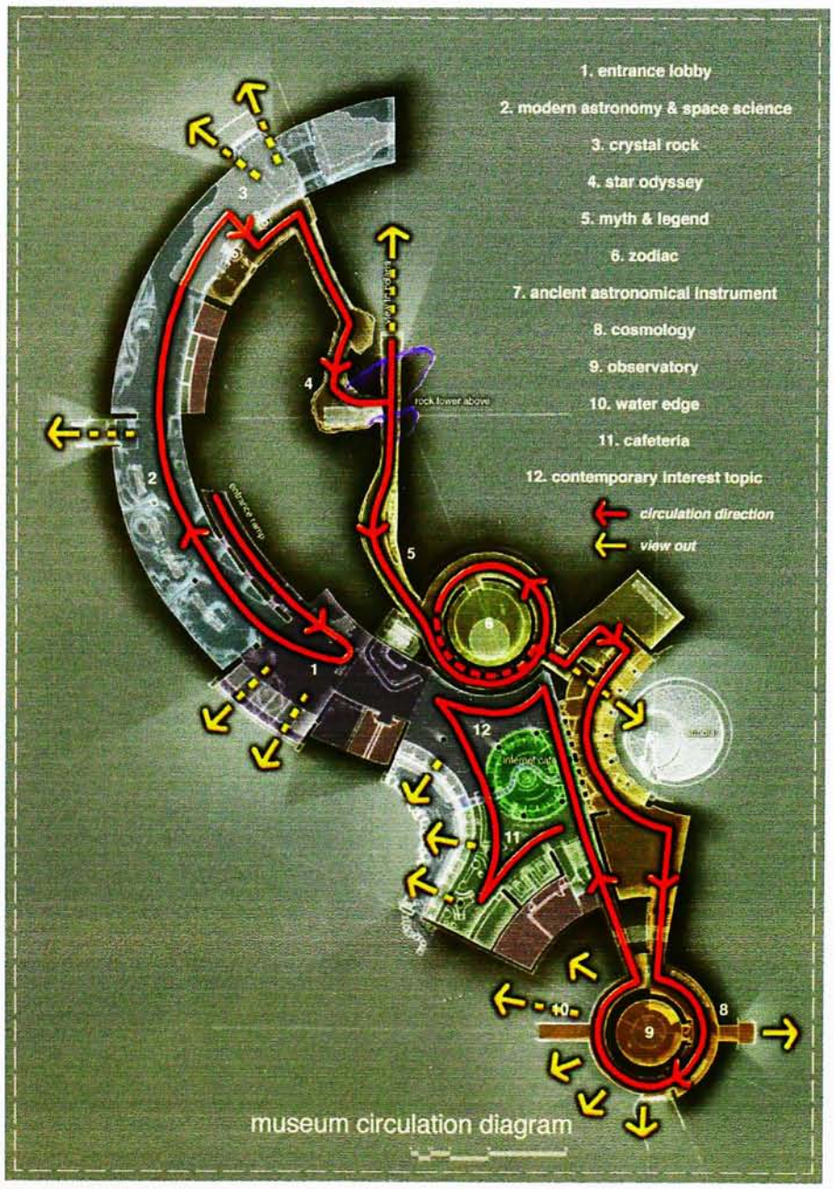


MUSEUM SEQUENCE - FINAL DESIGN

Different from other museums with flexible free circulation exhibition areas, the museum here is designed with predefined sequence of exhibits to construct the whole story. As a result, the museum is a series of path and nodes with different themes conveying different messages.

Along the sequence are spaces with changing size, form, altitude, material, mood, light, view, acoustic ambience, openness and degree of contact with natural elements.

The museum journey starts with the more recent and familiar modern exhibits back to the ancient thought and understanding of the celestial in the contexts of related natural elements. It finally ends up at a place where people can rest and discuss.



Experience along the museum sequence

Passing through the tunnel which forces into the ground comes a naturally lit entrance foyer. After the admission process at the reception with people chatting on the background, we turn and be able to look out back at the natural path we take before arriving here. The ***Modern Astronomy and Space Science museum*** *is a generous space with chambers of exhibits along the path. With occasional skylights lighting from above, we find ourselves under/inside the* ***crystal rock*** *which we had passed before in different level. At here, there are steps leading to a mysterious tunnel.*

The tunnel is darker and tighter, with sparkling stars on top, it leads us climbing up this ***Star Odyssey*** *and we find exhibits at certain points reconstructing the scene of how ancient people look at stars. Out of imagination they group stars into constellations and then we find ourselves face a giant* ***star altas rock carve*** *lit by the skylight on top. On the sides of the skylight, we can see the side of the magical* ***rock tower!*** *! Going up, we are drawn by the light on the left where the* ***polaris tube*** *points straight at polaris with a prominent view to the Fat Tong Mun where numerous vessels come and go. Yes, the constellations were the only tool that ancient man could used for navigation at night.*

Turning back we continue following the tunnel and it is ramping down. There is a stage with a number of figures from Greek myths: Orion, Pleiades, Scorpius . . . Continuing in this ***myth and legend*** *zone, a series of chambers warp down with each of these projects a legend underlying each constellation. It is non-scientific but romantic, and it reveals ancient man's imagination on the mythical phenomena and their interpretation of constellation groupings.*

Suddenly we find a giant spheric space which forms the centre of the previous paths. It is dim and giant with a hole on the ceiling, through this hole a light beam manages to penetrate in and marks a spot on ground. From the ground pattern and location of the sun spot, we are able to find out the current constellation along the ***zodiac.*** *Yes, sun migrates in north-south direction from day to day and complete a cycle in a year. And it is the location of sun along its ecliptic forms the twelve constellations of zodiac. And as the sun sets, the top part of the zodiac around the hole just becomes transparent and we can look out at the constellation six months after.*

Coming out, we continue with a few more chambers of zodiac legends and we find a bright view to outside. With sudden release of spatial scale, we go out to a semi-opened curving corridor. On the left is a row of inclined columns with ***ancient astronomical instruments*** *placing on foreground and opens to the outside open space and sundial as background. On the right is a series of vertical striped windows and doors providing visual connection to the internal cafeteria where we had seen in the foyer. Looking carefully at the sundial and we find it comprises two statues with their fingers stretching out almost touching each other. It just resembles Michelangelo's* ***"Creation of Man"*** *from Sistine Chapel. Sun light passes through their fingers' tension gap and leaves traces on the sundial disc. However, as time passes and when the sun set, the sundial disc is flooded with water till the following morning when sun rises again.*

Being attracted by an ambience sound of water, we climb up another flight of stair and a water fall just on our right. We continue up and arrive another curving space. It is filled with exhibits of the evolution in ***cosmology*** *and warp around the* ***astronomical observatory*** *at centre. As technology advances, the modern astronomical telescopes just look for the origin of our universe and the formation of stars by looking at distant celestial objects.*

At the end of the cosmology, we come out to an open space and we encounter a ***reservoir:*** *A reservoir defined by pebbles and rocks along its edge. As we progress, the boundary of the reservoir suddenly disappear, and we can only see the edge of water. The water falls and recalls the ancient cosmological thought of free falling edge of our planar world. Look closer, the* ***water edge*** *blends with the distant sea from where we come to the island.*

To continue and we go down a stair leading to the ***cafeteria*** *and* ***current interest topic*** *area where we have seen before. In here, we can stop, rest and discuss about all we have just experienced.*

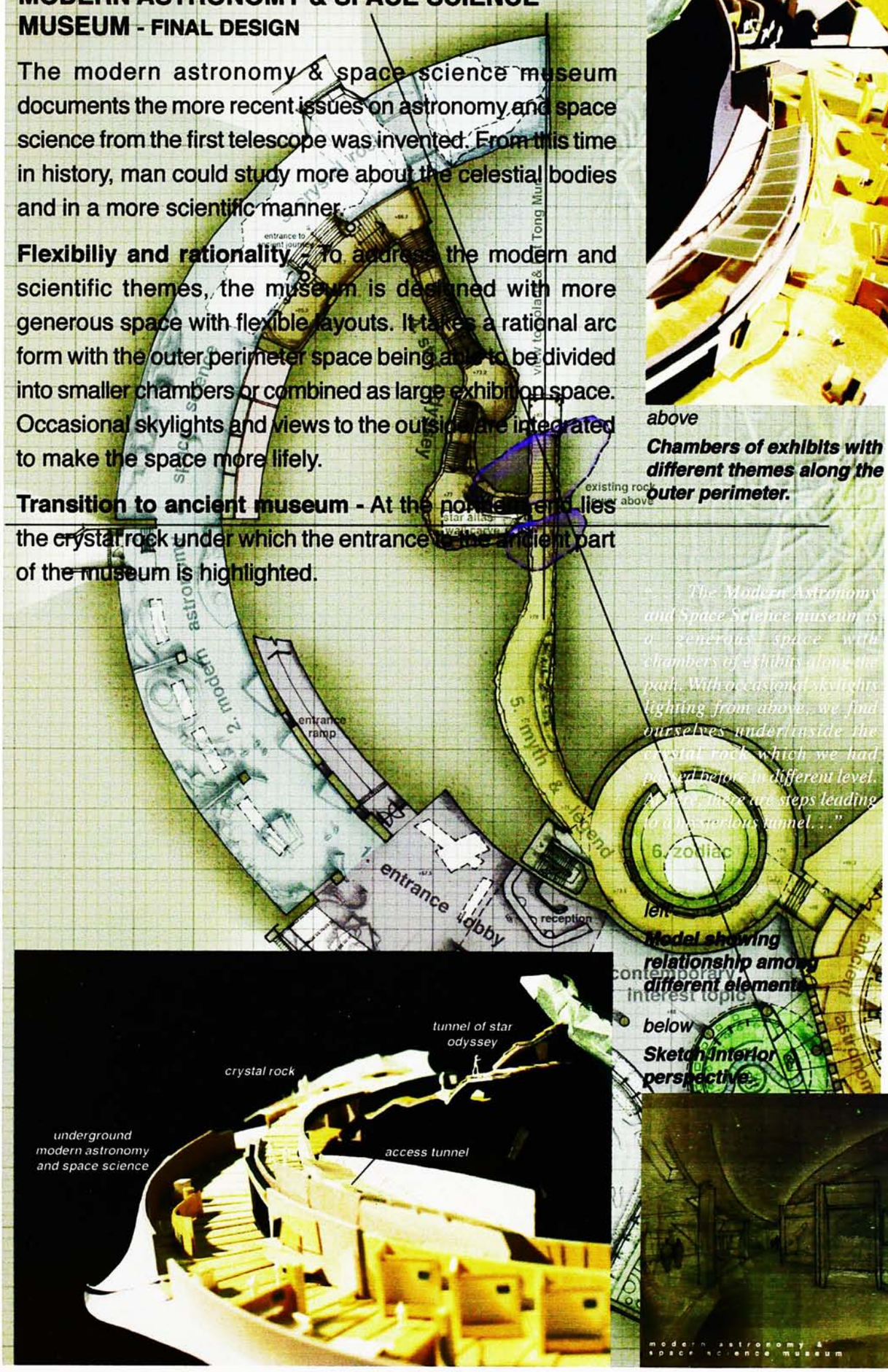
MODERN ASTRONOMY & SPACE SCIENCE MUSEUM - FINAL DESIGN

The modern astronomy & space science museum documents the more recent issues on astronomy and space science from the first telescope was invented. From this time in history, man could study more about the celestial bodies and in a more scientific manner.

Flexibiliy and rationality - To address the modern and scientific themes, the museum is designed with more generous space with flexible layouts. It takes a rational arc form with the outer perimeter space being able to be divided into smaller chambers or combined as large exhibition space. Occasional skylights and views to the outside are integrated to make the space more lifely.

Transition to ancient museum - At the north end lies the crystal rock under which the entrance to the ancient part of the museum is highlighted.

above
Chambers of exhibits with different themes along the outer perimeter.



"The Modern Astronomy and Space Science museum is a generous space with chambers of exhibits along the path. With occasional skylights lighting from above, we find ourselves underneath the crystal rock which we had passed before in different level. At last, there are steps leading to the mysterious tunnel..."

left
Model showing relationship among different elements

below
Sketch interior perspective.

STAR ODYSSEY - FINAL DESIGN

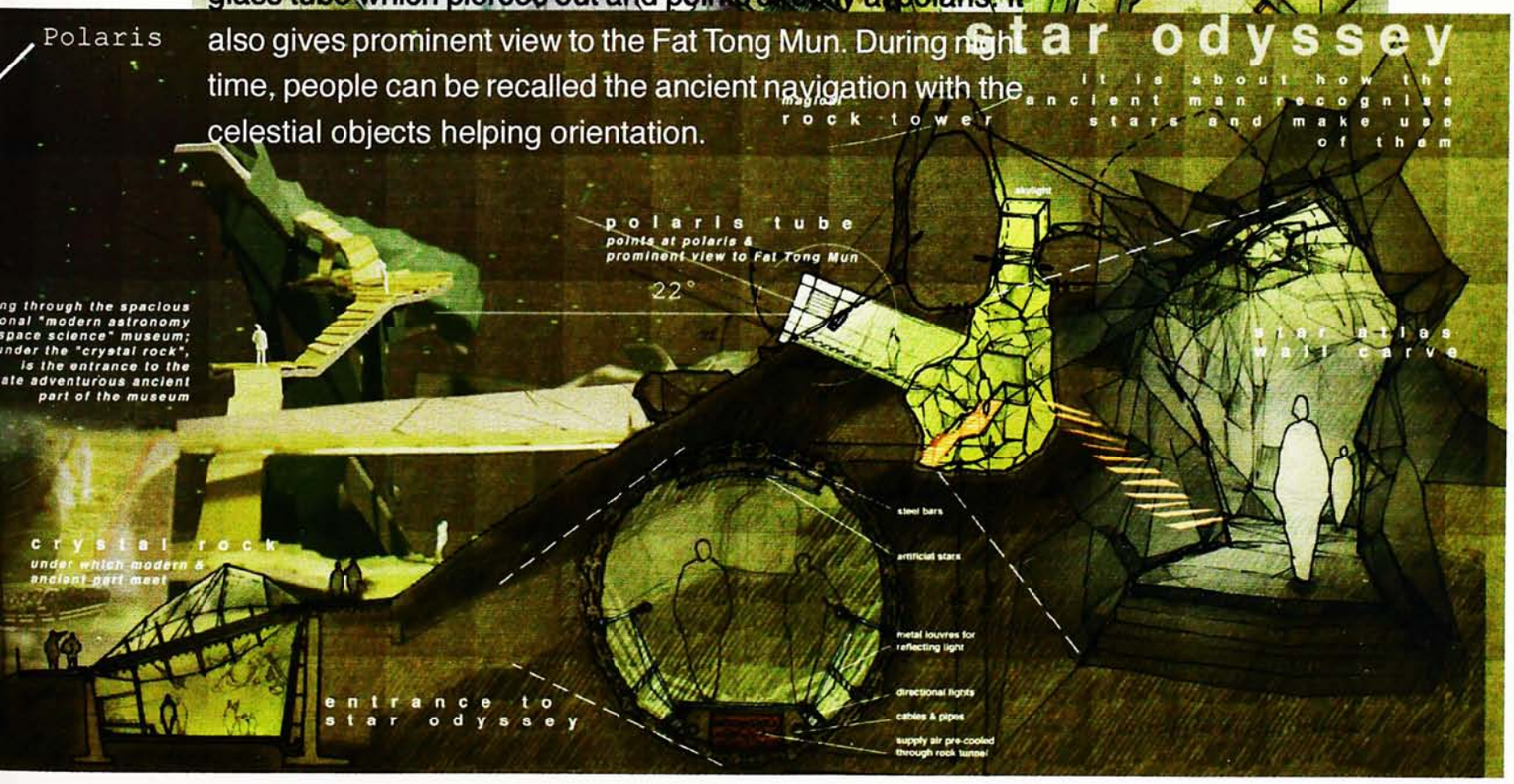
The star odyssey is an intimate adventurous path with exhibits and spatial settings that reconstruct how the ancient man recognise stars and make use of them to visitors. The entrance is framed by the **crystal rock** on top which stands as a modern reinterpretation of old age rock.

Tunnel interior - The star odyssey tunnel is decorated with artificial stellar way on top. The side is rock covered by bare spray concrete surface - **roughness** is going to be achieved. The pathway is constructed with unslippery rubber finished panels raised by steel studs below. Spot lights are installed on both sides to light side walls from below while lourves on the side railings reflect some light to light up the path.

Rock carve - The roughness and climbing stair help to achieve the adventurous mood in uncovering the history of man. Certain exhibits are installed along its route and a giant wall rock carve of star altas is one of its major nodal point. The rock carve is a huge space with skylight on top. Inside it, visitors can also see part of the sides of rock tower above. Both celestial bodies and sculptural rocks were thought mysterious and holy in the ancient culture.

Polaris tube - Turning up from a side stair connects to a glass tube which pierces out and points directly at polaris. It also gives prominent view to the Fat Tong Mun. During night time, people can be recalled the ancient navigation with the celestial objects helping orientation.

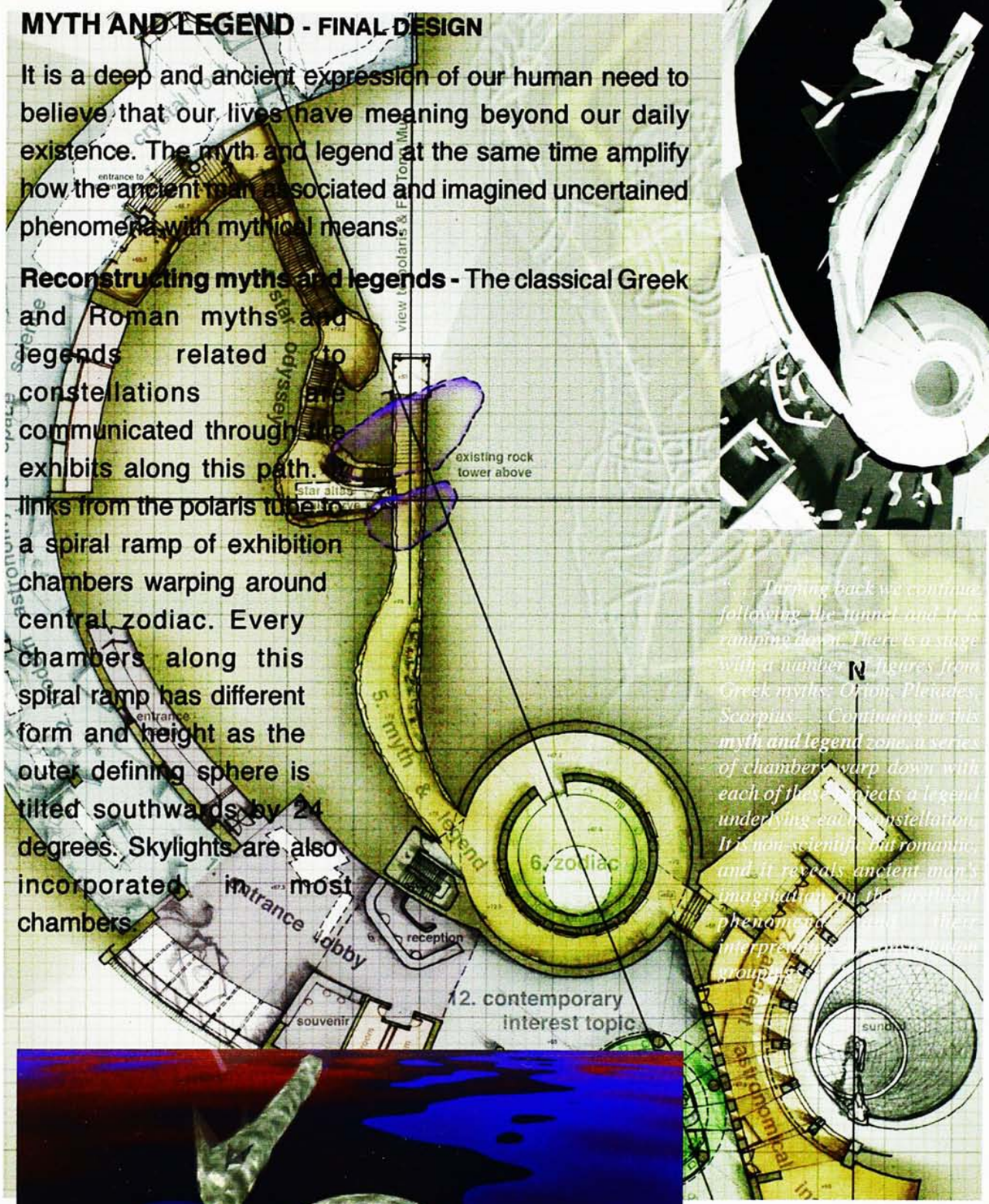
"... The tunnel is darker and lighter, with sparkling stars on top. It leads us climbing up thus Star Odyssey and we find exhibits at certain points reconstructing the scene of how ancient people look at stars. Out of imagination they group stars into constellations and then we find ourselves face a giant star altas rock carve lit by the skylight on top. On the sides of the skylight we can see the side of the magical rock tower. Going up, we are drawn by the light on the left where the polaris tube points straight at polaris with a prominent view to the Fat Tong Mun where numerous vessels come and go. Yes, the constellations were the only tool that ancient man could used for navigation at night. ..."



MYTH AND LEGEND - FINAL DESIGN

It is a deep and ancient expression of our human need to believe that our lives have meaning beyond our daily existence. The myth and legend at the same time amplify how the ancient man associated and imagined uncertained phenomena with mythical means.

Reconstructing myths and legends - The classical Greek and Roman myths and legends related to constellations are communicated through the exhibits along this path. It links from the polaris tube to a spiral ramp of exhibition chambers warping around central zodiac. Every chambers along this spiral ramp has different form and height as the outer defining sphere is tilted southwards by 24 degrees. Skylights are also incorporated in most chambers.



above

Model showing the route of myth and legend connecting to the giant sphere.

left

Computer image showing the spiral ramping path inside the huge sphere while warping around the central zodiac.

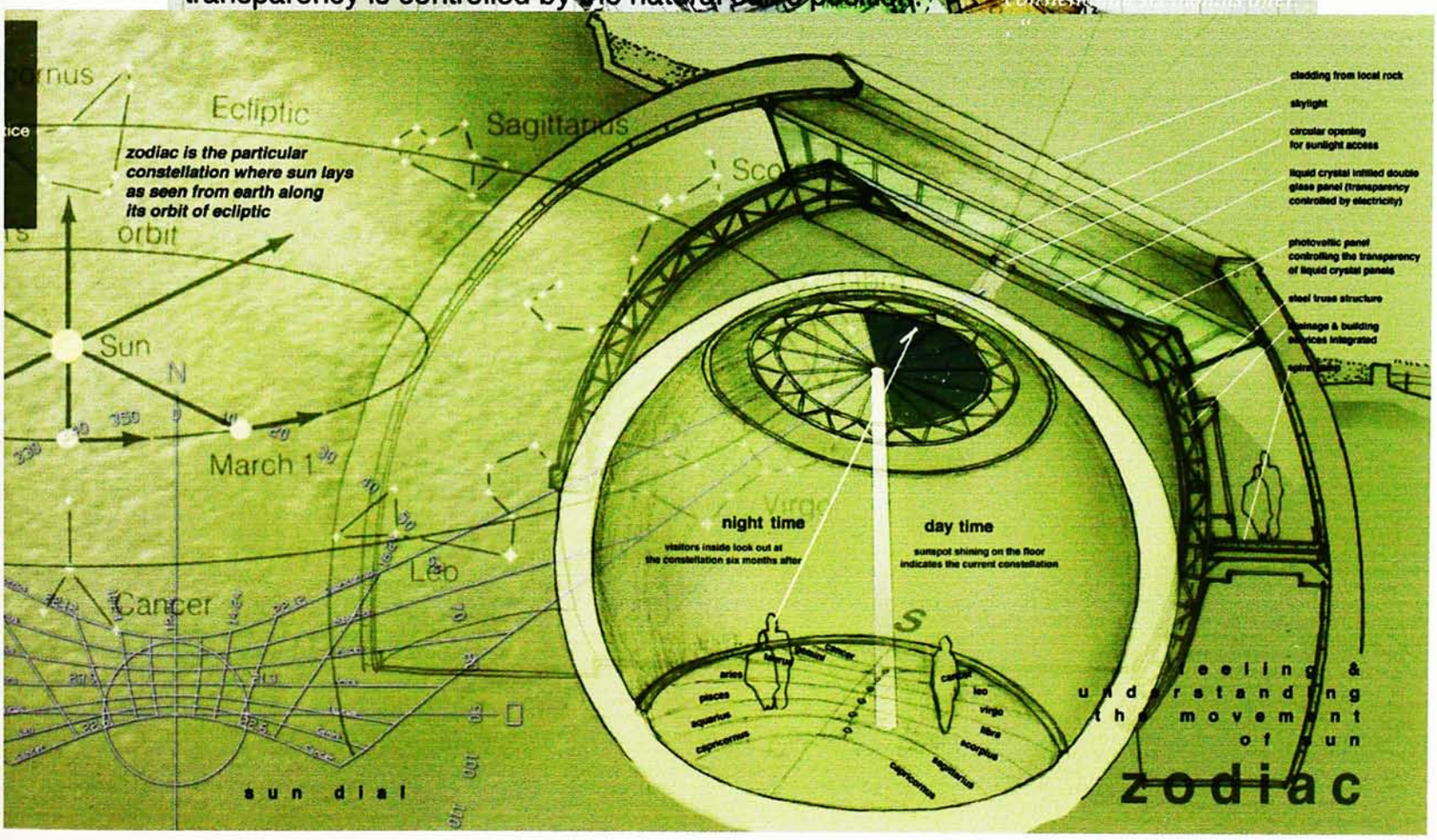
ZODIAC - FINAL DESIGN

Zodiac is a major nodal point along the adventurous route of ancient museum. Its giant space with the play of solar phenomena connects people with the context of natural element. From the motion of sun migrating north and south throughout a year, visitors can trace which month or zodiac constellation is currently in.

Isolating sun - By focusing only one natural element, **sun**, and showing its phenomena, visitors can grasp more easily the issues and the underlying principles behind. In addition, association with the ancient astrology can also be made.

Diurnal difference - By adopting advanced technology, different spatial characters inside the zodiac can be achieved between day time and night time.

Penetration of sunlight is controlled and projected on the ground during day time. On the other side, the top ceiling is transparent during night time to allow view out to the constellation six months later. This dynamic change is to be achieved by installing liquid crystal infilled panels controlled by photovoltics on the external perimeter. As a result, the transparency is controlled by the natural sun's position.



ANCIENT ASTRONOMICAL INSTRUMENT - FINAL DESIGN

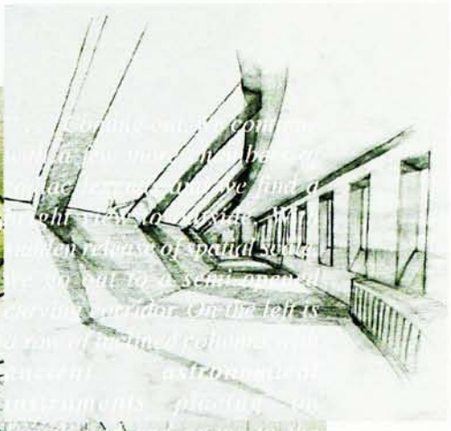
Following with the imagination and mythical explanation of the celestial objects in zodiac and myth & legend, the **ancient astronomical instrument** displays the ancient instrument for recording and predicting the celestial motions.

Embracing sundial - It is a semi-open corridor with close contact with the natural elements. The big inclining columns on the left create a middleeast like arc warping around the outdoor sundial.

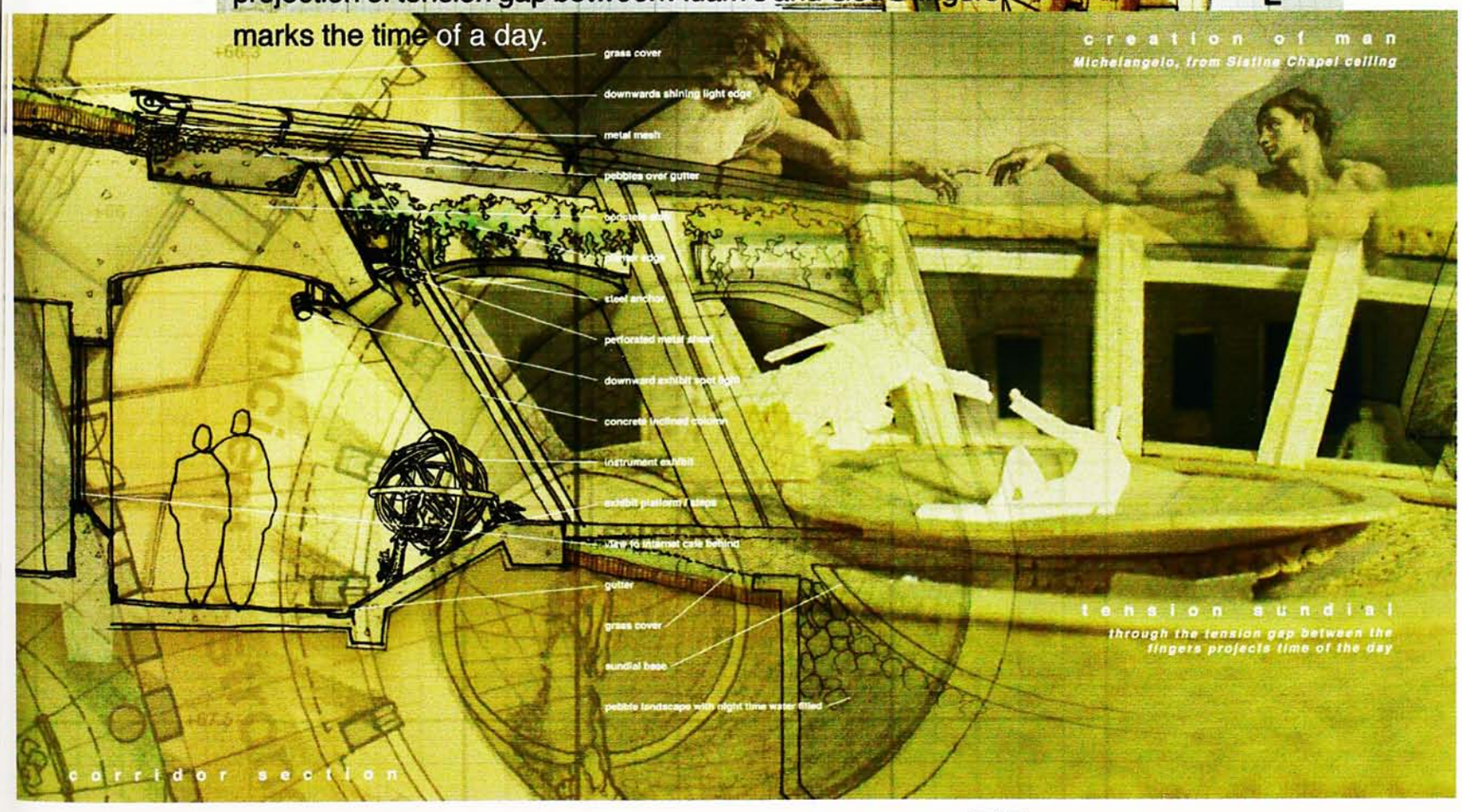
Sectional treatment - Planters are installed on the outside to highlight only the vertical array of columns. Section of the space is designed to minimise light leaking out which otherwise will affect the eastern star viewing slope.

Barrier free perimeter - Landscape on top is designed with minimal projected boundary definition. To ensure safety, a row of lighging fixtures is installed and pebbles covering is designed beyond, to prevent visitors from falling down the edge.

Tension sundial - The sundial is designed to resemble the famous painting, ***Creation of Man***, by Michelangelo. The projection of tension gap between Adam's and God's fingers marks the time of a day.



...corridor. On the left is ... astronomical instruments ... and opens to the ... outside open space and sundial as background. On the right is a series ... vertical striped window ... and doors providing ... connection to the internal ... cafeteria where we had seen in the foyer. Looking carefully at the sundial and we find it comprises two statues with their fingers stretching out almost touching each other. It just resembles Michelangelo's "Creation of Man" from Sistine Chapel. Sunlight passes through their fingers' tension gap and leaves traces on the sundial disc. However, as time passes and when the sun set, the sundial disc is flooded with water till the following morning when sun rises ...



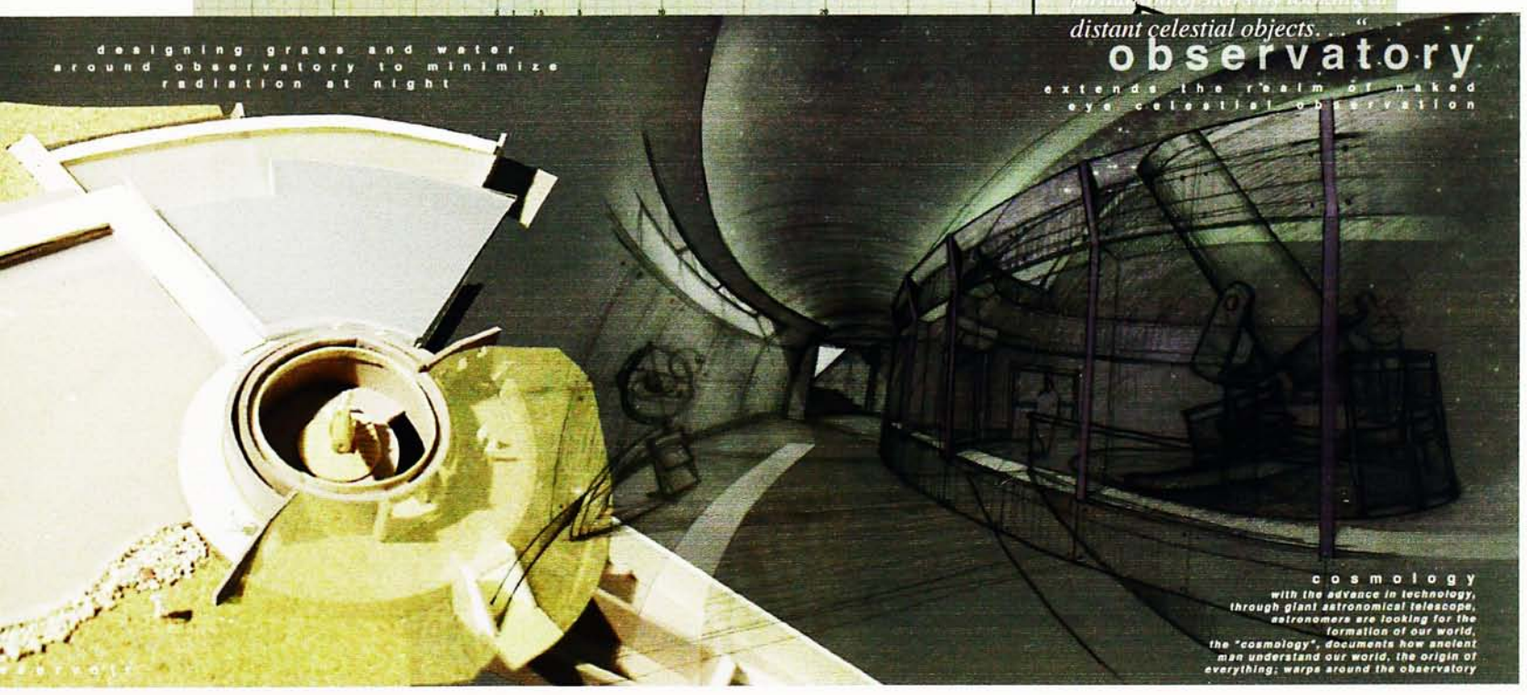
COSMOLOGY AND OBSERVATORY - FINAL DESIGN

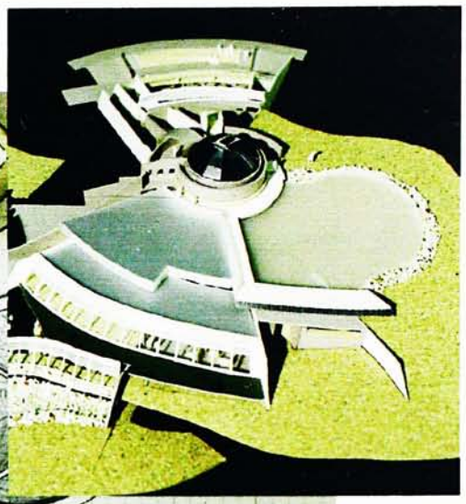
Cosmology records the evolution of the different models of universe and the origin of our world. With the contemporary attempts in looking for the formation of stars by studying distant celestial objects, the astronomical observatory stands on similar ground. In this sense, the cosmology museum warps around the observatory and they form the intersection of museum zone and observatory zone.

Relationship with rock tower - To avoid two point focus relationship, the observatory is designed to merge more with the surroundings in a planar manner. This results in a planar artificial observatory landmark versus a point natural rock tower landmark.

Seeing - Realising the inherent difficulties in ***transparency*** and more suitable ***seeing*** measure (p. 24), grass and water are designed around the observatory. This is to reduce radiation from concrete ground during sunset which will adversely affect the degree of seeing.

Azimuth observing angle - As azimuth observing angle decreases, the distance required to pass through atmosphere increases and results in poorer seeing. Therefore, a minimum azimuth observing angle of 15 degree is designed. Because of this, the observatory can be less stand out from surroundings.





RESERVOIR AND WATER EDGE - FINAL DESIGN

Reservoir is for water storage to make the development sustainable in the island. Instead of pure functional value, the water storing here is planned to provide various purposes to make the reservoir more feasible.

Functions for the reservoir - For the zone of reservoir, it includes open air reservoir and enclosed water tanks. The open air reservoir works like a **decorative element** in the landscape with water flowing down to the artificial stream and recycled back. The continuous flowing helps to create a **relaxing ambience**. At the same time, water stored is used for **sprinkler systems** inside the complex. During sunset, water flows over the west facing glazing of workshop and cafeteria and help to **screen out low angle sunlight**. In addition, the thermal properties of the water has low diurnal difference which **reduces heat radiation** at night and enhances seeing. Besides, there is a fresh water tank under the cascading water edge for fresh water supply and a smaller sea water tank as part of the sea water cooling system for the AHU.

At the end of the cosmology we come out to an open space and we encounter a reservoir. A reservoir defined by pebbles and rocks along its edge. As we progress, the boundary of the reservoir suddenly disappear and we can only see the edge of water. The water falls and recalls the ancient cosmological thought of free falling edge of your planar world. Look closer, the water edge blends with the distant sea from where we came to the island. "

Defining reservoir - To reduce site formation work and avoid awful extruding structure as option 2b, the reservoir is enclosed by adding a segment of building to an existing C-shaped landform.

Two segments of reservoir defined by adding building element to a C-shaped landform

Edge of the Earth and connection back to the sea - The giant element of reservoir is articulated and planned as part of the museum route. The first segment of reservoir visitors encounter has boundary defined by pebbles. As visitors progress to the second segment of reservoir, the **water edge**, they find the edge of the water disappear, and the water just falls beyond the edge. It is to refer back to the ancient cosmological thinking of a planar Earth with water on perimeter and everything just fall over the edge. At the same time, by designing with the site topography, the water edge just merge with the sea when viewed from eye level along the path.

below

As progress, visitors find the definition of water boundary disappear and beyond the water edge, the view connects back to the sea.

CAFETERIA, INTERNET CAFE & CONTEMPORARY INTEREST TOPIC - FINAL DESIGN

These are the termination of the museum sequence and also the places where friends or families can rest and discuss.

Centre of the whole museum - Though these areas are the termination points, they are physically the centre of the museum. At the same time, visual connections to this area are integrated at various locations along the museum route, making this place an interior orientation landmark.

Digital connection to outside - Internet cafe is the introvert centre of the museum, while at the same time it connects out the other parts of the world through digital networks. This enables visitors being physically in a remote island but still keeping in touch with outside world.

Blurred interior / exterior boundary - To enhance visitors feeling the closeness with nature, a high transparency enclosure is designed along the western facade viewing back to the pier and undulating green landscape. At the same time, a stream is designed to flow along the perimeter giving a relaxing ambience. Furthermore, certain natural elements like sand and water are introduced into the interior to help blending the boundary.

Milkyway separating Altair and Vega - From a well-known oriental legend, Altair and Vega were couple who separated by the Milkyway in the sky due to their fault. Currently, they can only meet once a year. This legend is integrated into the design of internet cafe. A river of "Milkyway" is introduced from the outside stream through the internet cafe. On the two sides stand the statues of Altair and Vega. *"Can the technology bridge the two pity couple together?"*

above

Altair was a ox raising peasant while Vega was a weaving girl. From this settings enhance the atmosphere of space.

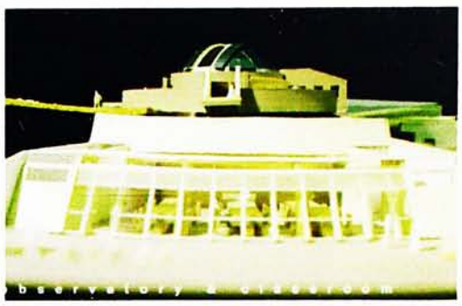
"...To continue and we go down a stair leading to the cafeteria and current interest topic area where we have seen before. In there, we can stop, rest and discuss about all we have just experienced."

ASTRONOMICAL OBSERVATORY & STAR GAZING CLASSROOM - FINAL DESIGN

Looking at celestial objects is the major activity in the complex. It should be through the self involvement of looking at stars that visitors can develop their own affection towards nature. Occupying unobstructed east facing slope, visitors can see celestial objects rising from eastern horizons.

Instruments assisting observation - Naked eye star gazing is the primary activities. To allow more in-depth and different experience in observation, portable telescope and fixed astronomical telescope are provided. With the assistance from the instruments, different levels of observation can be achieved.

Role of technology - Advanced technology is applied in making star gazing class functionable. Wireless network is installed in the natural observing platform beyond the mini-amplitheatre. As a result, communication among students and tutors can be achieved through the wireless network and digital star altas can be used in the teaching.

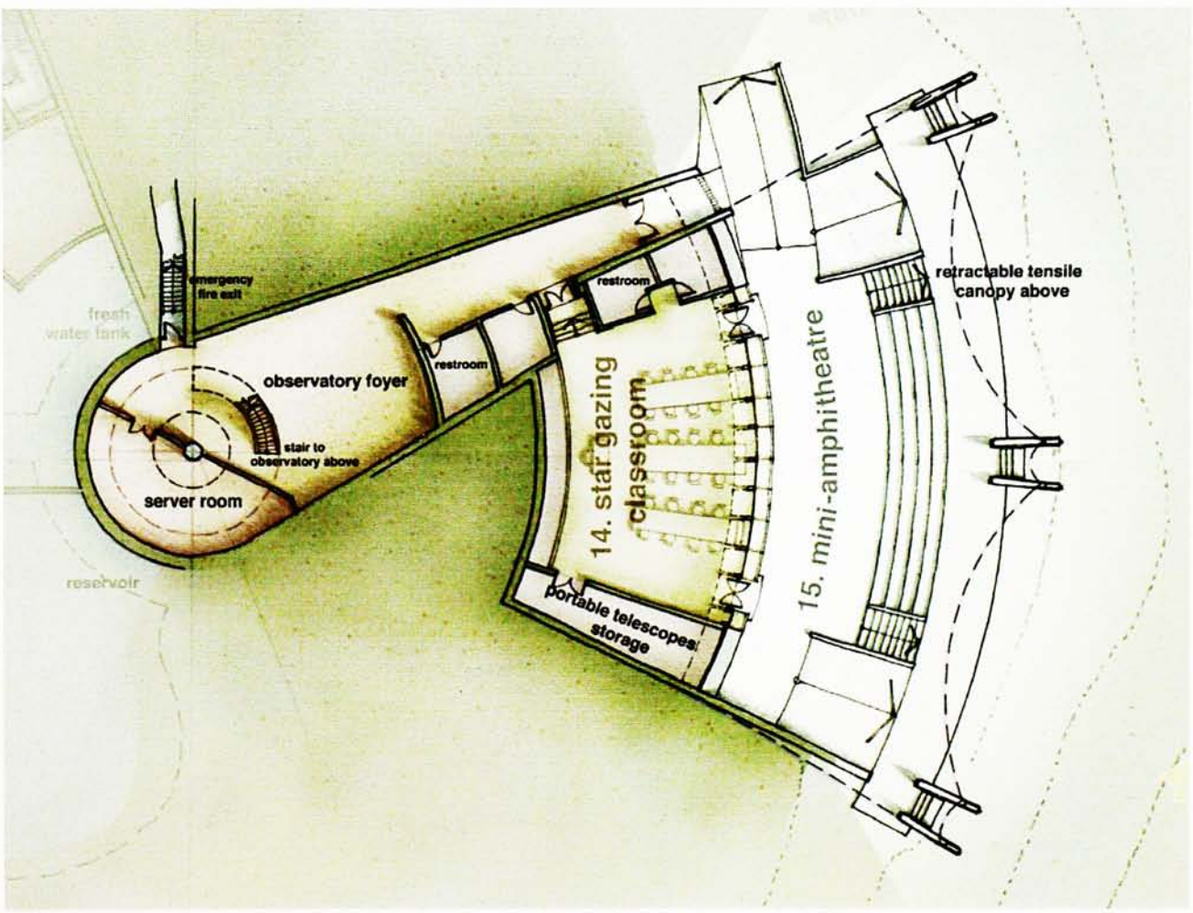


above

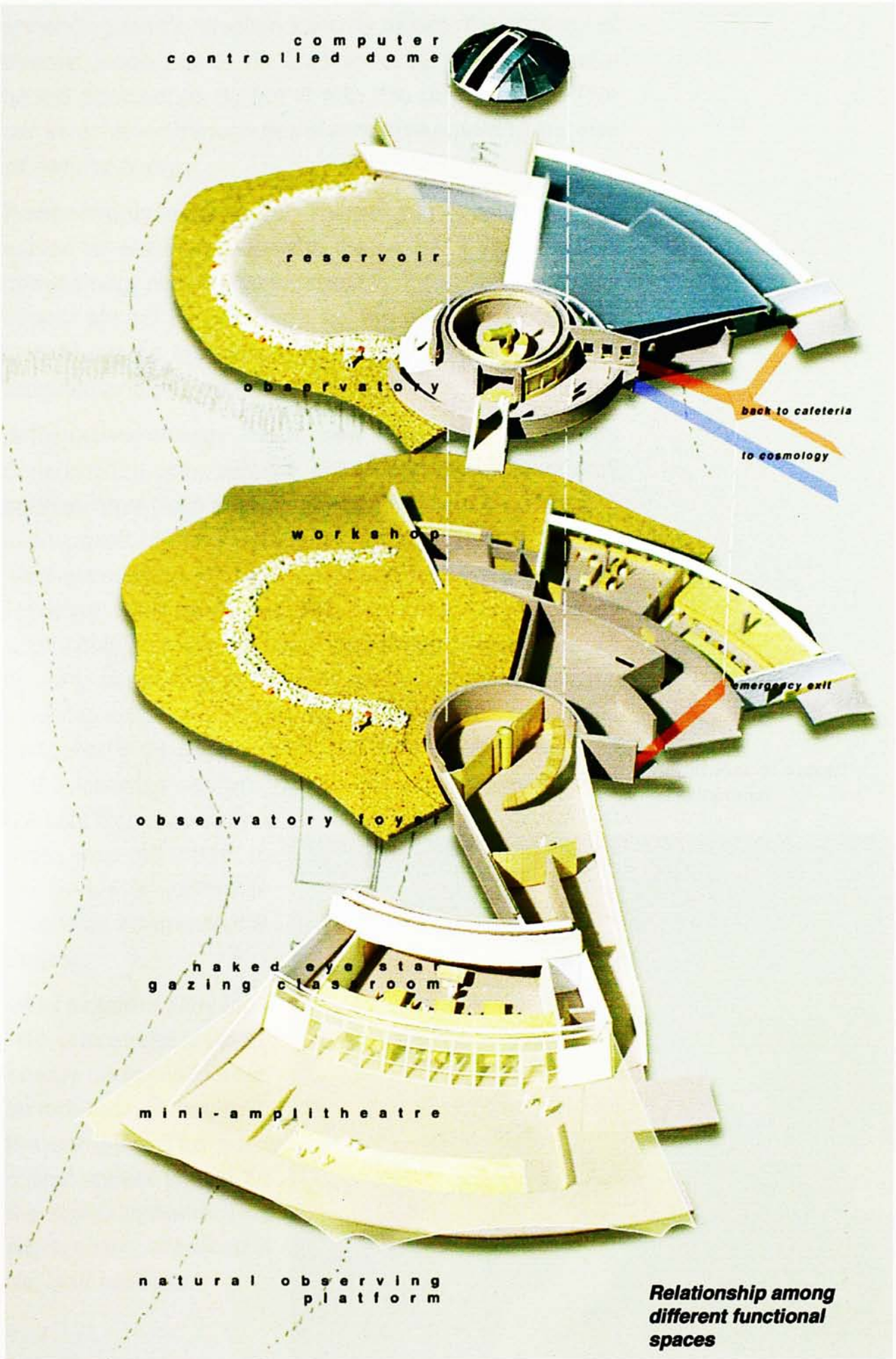
View of mini-amplitheatre outside classroom with the observatory in the background.

below

Plan of star gazing classroom, observatory foyer and associated functions.



ASTRONOMICAL OBSERVATORY & STAR GAZING CLASSROOM - FINAL DESIGN



Relationship among different functional spaces

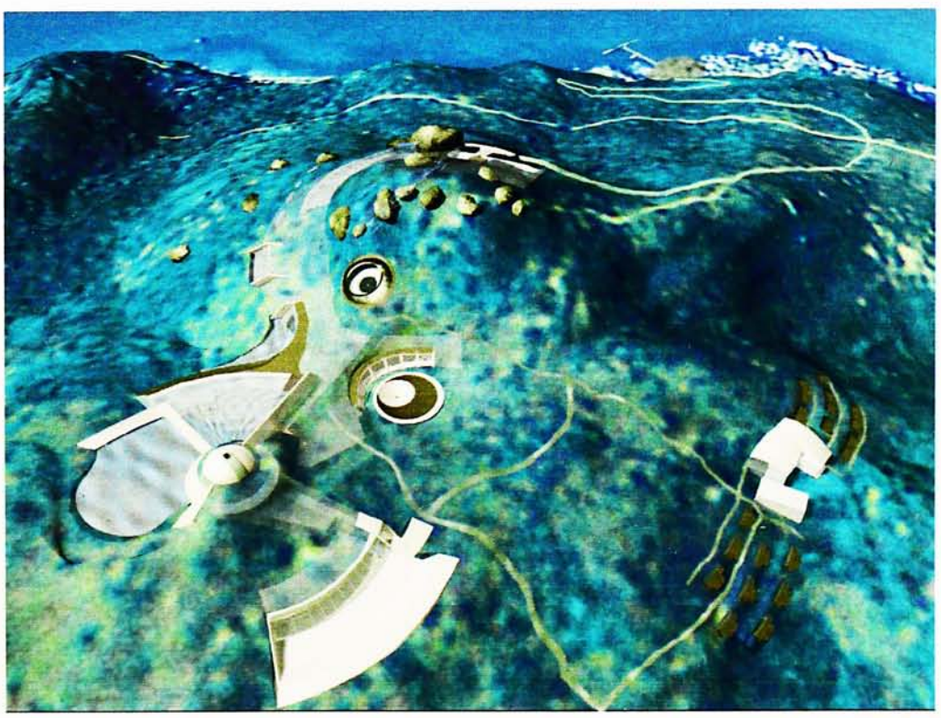
USE OF ENERGY - ENVIRONMENTAL

As an architecture in natural settings with the objectives of enhancing man's affection towards nature, the strategy of energy usage has to be environmental friendly. Normal typical approaches do not fit with this development. This can be achieved through ***initial sensitive planning*** and ***use of natural energy***.

Power supply in the island - There are some existing power cables for electricity supply in the island. If strategies for use of energy can be planned carefully, the existing electricity supply should be adequent for the proposed complex. Cables can be branched out from the current line to the transformer room in the development.

Alternative energy resources - To minimise energy consumption from existing power supply, other energy sources have been considered. As already been discussed in Sustainability and Energy from Nature section (p. 21), wind and solar energy have the most potential in application. However, wind speed has been significantly reduced as approaching the site from east. Investment in wind mills will be very unfeasible with extensive visual impact on the landscape. Consequently, only solar energy is planned to be applied in the development. This will be further examined in the following section. Though the cost effectiveness is not very high especially a high capital cost is involved, it is worthwhile to work as a demostrative project.

below
Aerial view of overall development



Initial sensitive planning - With critical examination, energy consumption can be reduced significantly in the complex. The most critical aspect should be the HVAC systems. This will be further examined in the later sections.

USE OF ENERGY - ENVIRONMENTAL

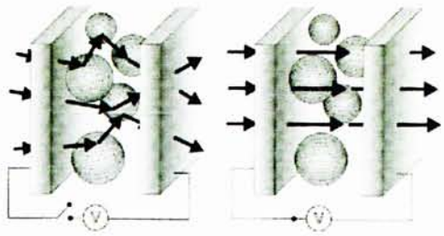
Photovoltics

The current photovoltics technology is still not very advanced and this results in inefficient solar energy generation. In addition, the unpredictable cloud cover over the year makes the application of solar energy not being reliable. As a result, only several uncritical and low energy consumption uses can be applied.

Diurnal changes of zodiac - Concepts of making the complex dynamic with changes according to the surroundings are applied. The first one is the zodiac. During day time, only the hole on the ceiling allow the penetration of sunlight into the interior space and marks a light spot on the ground. When the sun sets, the peripheral panels around the hole become transparent automatically and allow visitors inside look out at the constellations in the sky.

This is to be achieved by constructing the peripheral with liquid crystal infilled panels. Each of the liquid crystal inside restrict light to pass through in especific direction. By making the liquid crystals aligning in same direction in its normal state, it is transparent. Applying a electric current parallel to the panel, that is perpendicular to view, the liquid crystals cut off any light that pass through.

With the integration of photovoltic cells around the liquid crystal infilled panels, the panels are opaque when there is sunlight while the panel will be transparent when the sun is out. This makes the automatic changes in the zodiac theoretically possible.

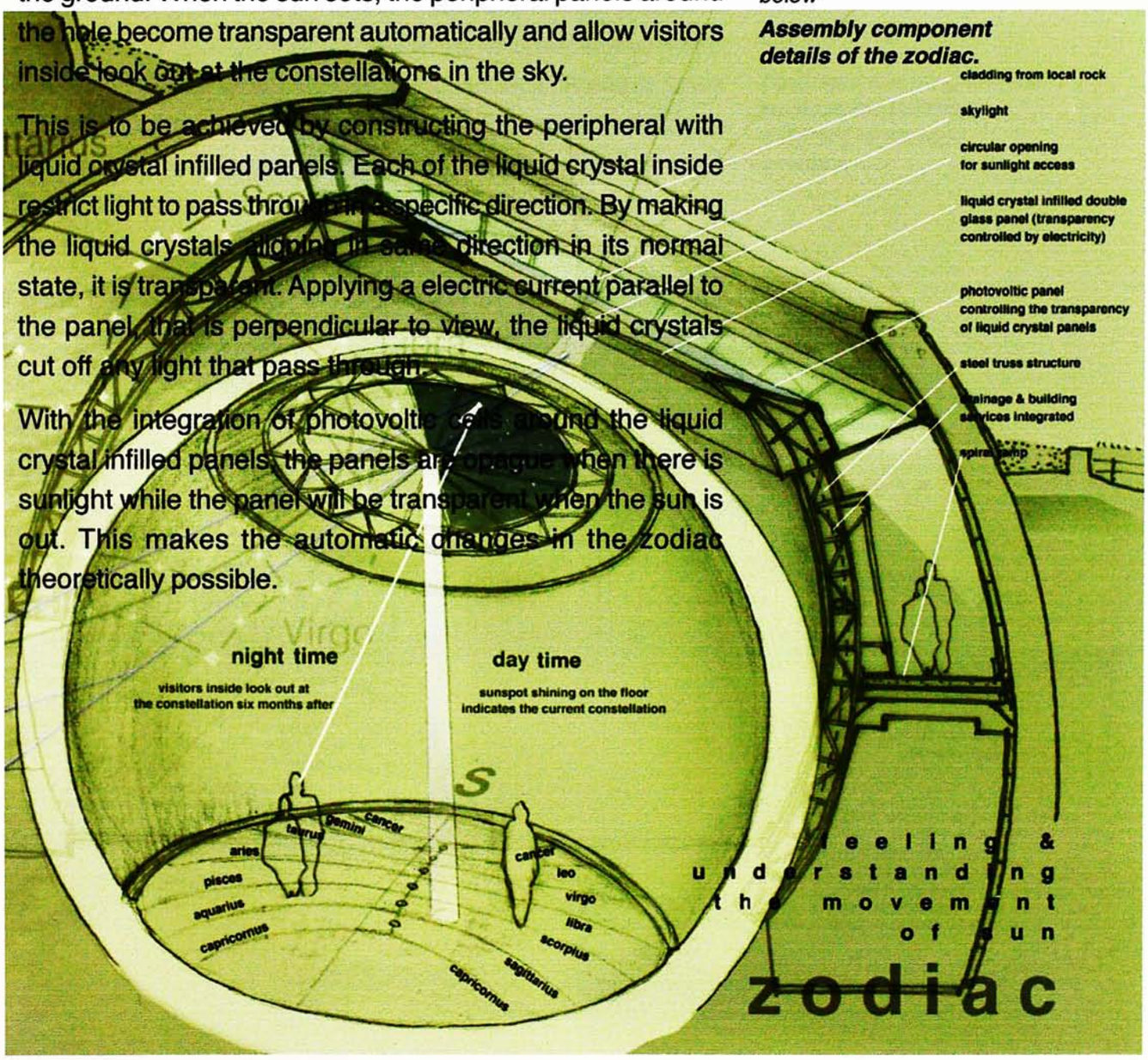


above

Liquid crystal infilled panel working in another manner. In noraml state, no electric current, the liquid crystals orient randomly and stop light penetration. When current is applied perpendicularly to the glass panel, the panel becomes transparent.

below

Assembly component details of the zodiac.



USE OF ENERGY - ENVIRONMENTAL

Photovoltics

Diurnal changes of reservoir and sundial - While the opening up of zodiac's "pupil" marks the interior diurnal changes, the **flooding of sundial** creates the diurnal changes of exterior landscapes.

Day time - During day time, water flows from reservoir down to the stream, into internet cafe and is recycled back to the water edge. This process for aesthetic and acoustic ambience uses the solar energy.

Sunset - During sunset, the gates on top of the workshop and cafeteria open by the photovoltic cells along the machine room. This releases water from reservoir down the west facing glazing creating a water sun screen. It helps to reduce interior solar gain during the critical sunset period and make different scenes when viewed from inside. The water flows down, pass through internet cafe and is collected in the sundial plaza. As a result, the sundial is flooded during night time and visitors around it can see the reflection of the stars from it.

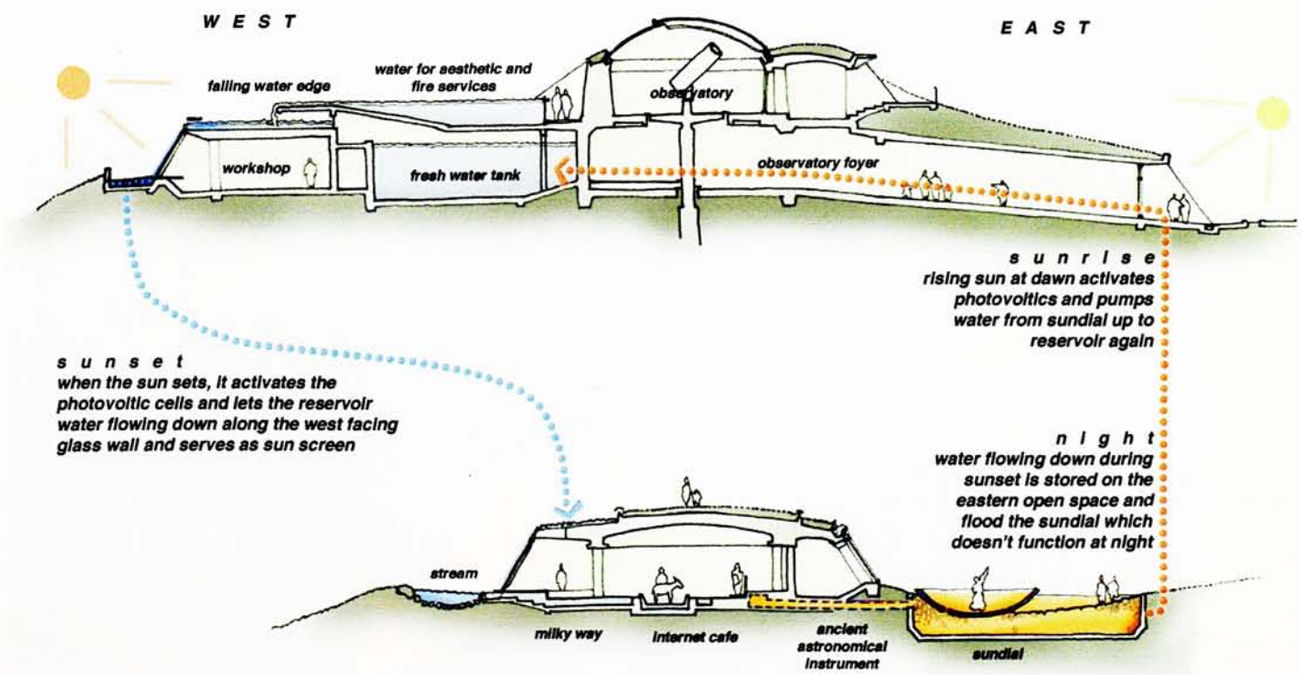
Dawn - When the sun rise from east in the morning, she activates the east facing photovoltic cells which pump water back up to reservoir. And the cycle completes.

above

Relationship among water edge, reservoir, workshop, cafeteria and stream.

below

Diagrams showing diurnal water cycle building different landscape scenery.



USE OF ENERGY - ENVIRONMENTAL

Photovoltics

Pumping sea water up - Sea water is used in cooling the Air Handling Units in the HVAC systems (p.90) to reduce visual impact on the landscape. This process requires sea water to be pumped from the sea to the development continuously (about 80m above datum). Solar energy is used in day time to reduce energy consumption from main.

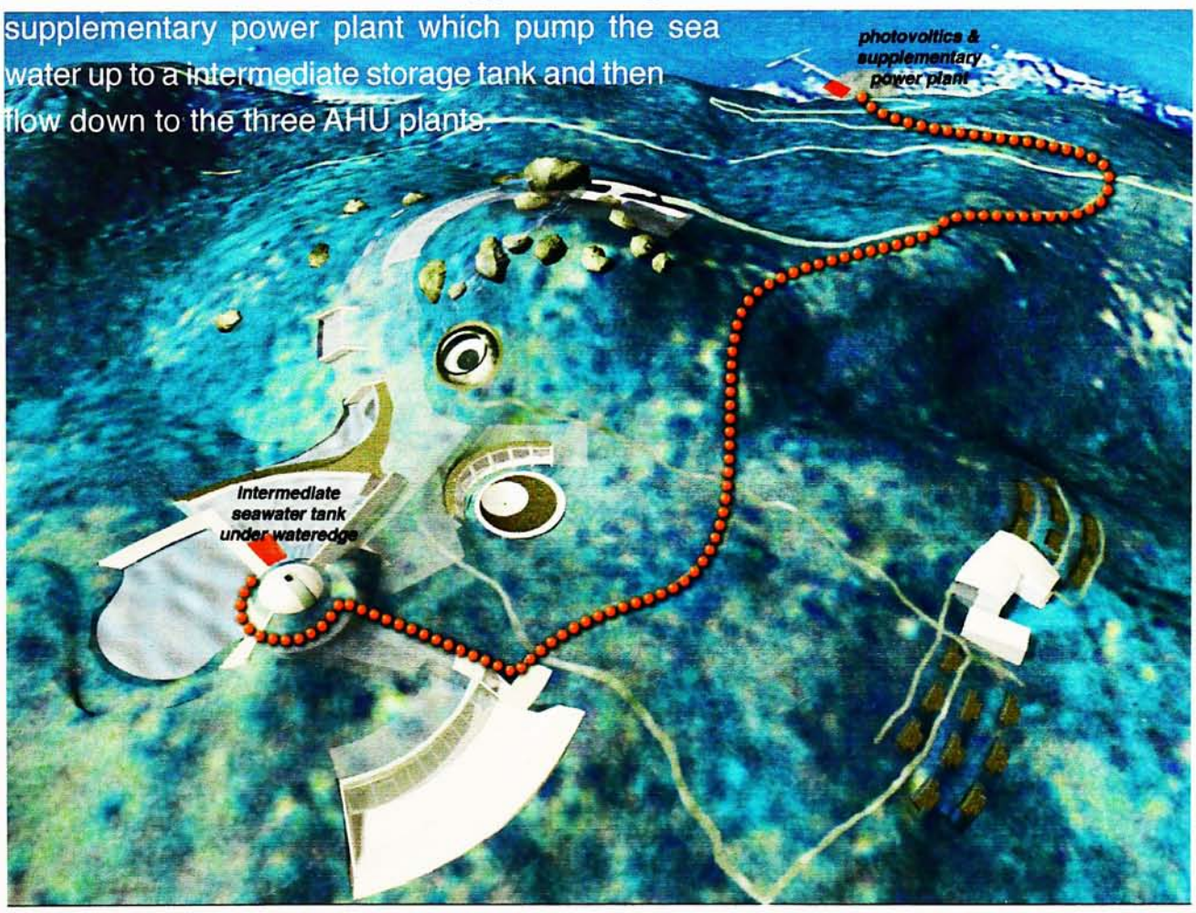
Initial attempt was to reserve one part of the reservoir for the storage of sea water which was filled during day time powered by solar energy. For the night time, the sea water just flow down from the reservoir's storage.

However, opening the sea water storage to air will make salt accummulate from the evaporation of sea water and make the reservoir unpleasant to visitors. In addition, the requirement of continuous flow of sea water, which cannot be recycled, implies gigantic storage volume; and the unavailable sunshine during cloudy day makes this approach difficult to be implemented.

For the final resolution, solar energy is used together with a supplementary power plant which pump the sea water up to a intermediate storage tank and then flow down to the three AHU plants.

below

Sea water pumped up from maintenance pier by photovoltics during day time and backup power plant when there is not enough sunlight.

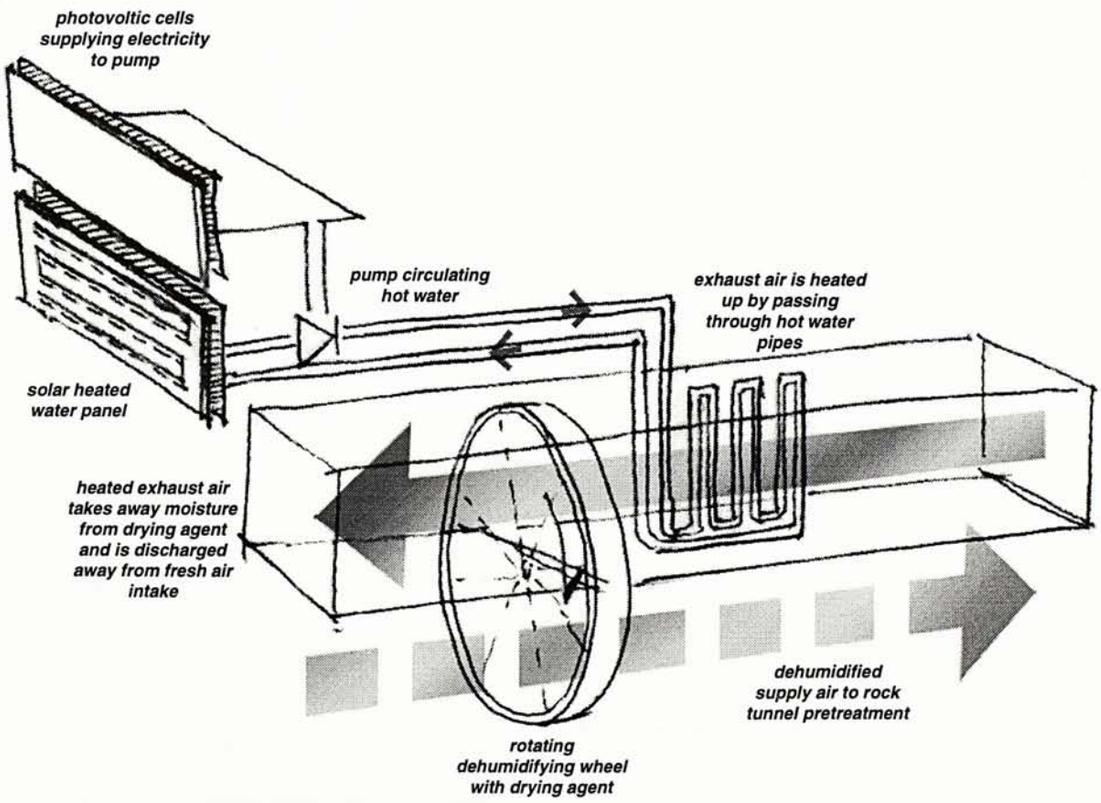


USE OF ENERGY - ENVIRONMENTAL

Photovoltics

Regeneration process of dehumdifying gel - The drying agent, silicon gel, in the dehumidifying wheel absorbs moisture from intake air and gets wet. The regeneration process of the agent takes place during day time by using solar energy.

A solar heated water pipe pumped by photovoltics, runs across the exhaust air duct before the air is connected to the dehumidifying wheel. The hot water raises temperature of the exhaust air and increases its absolute water capacity. The heated exhaust air then passes through the dehumidifying wheel and takes away moisture from the wet drying agent.



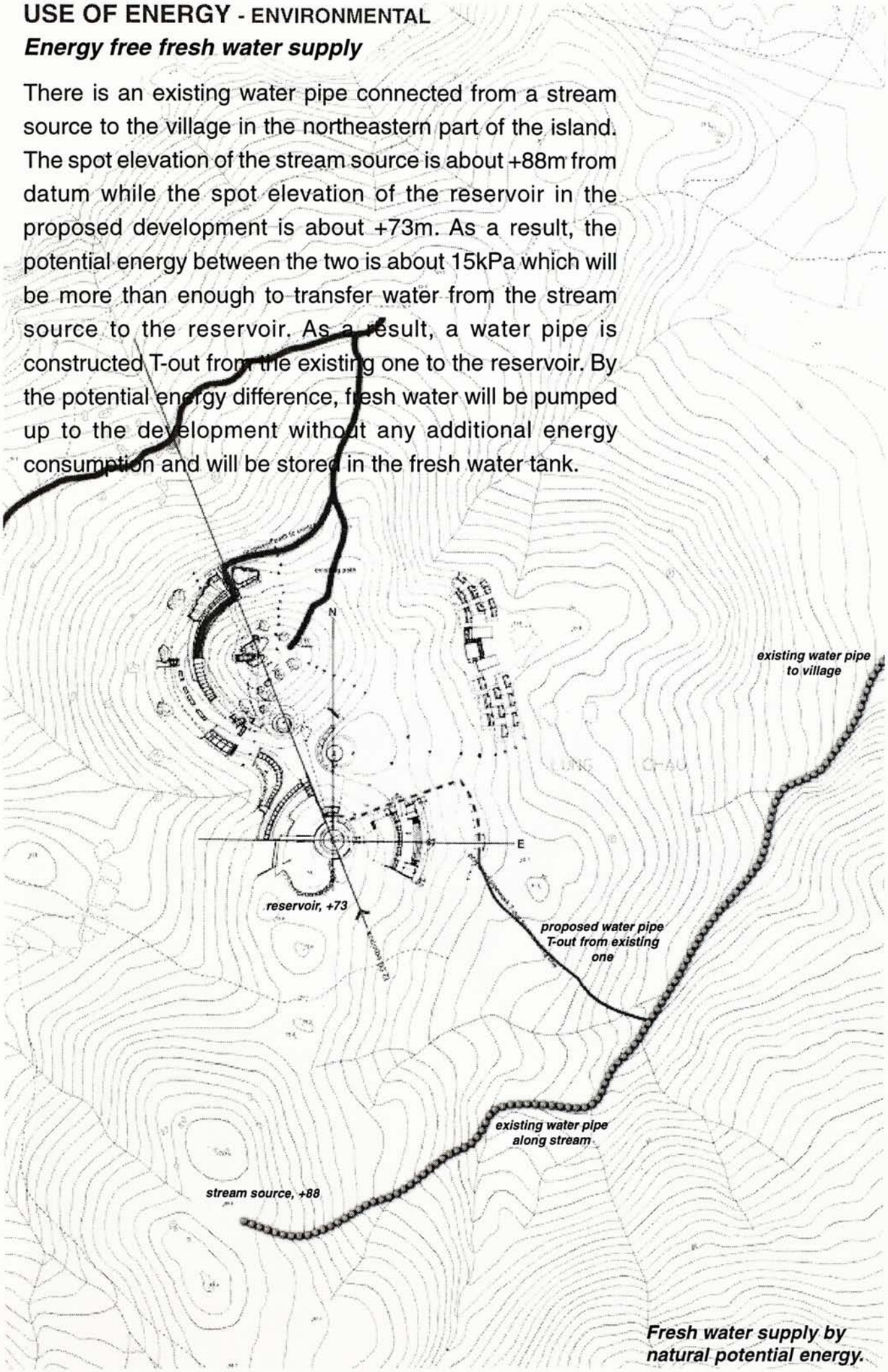
above

Regeneration process of dehumidifying wheel during day time

USE OF ENERGY - ENVIRONMENTAL

Energy free fresh water supply

There is an existing water pipe connected from a stream source to the village in the northeastern part of the island. The spot elevation of the stream source is about +88m from datum while the spot elevation of the reservoir in the proposed development is about +73m. As a result, the potential energy between the two is about 15kPa which will be more than enough to transfer water from the stream source to the reservoir. As a result, a water pipe is constructed T-out from the existing one to the reservoir. By the potential energy difference, fresh water will be pumped up to the development without any additional energy consumption and will be stored in the fresh water tank.



Fresh water supply by natural potential energy.

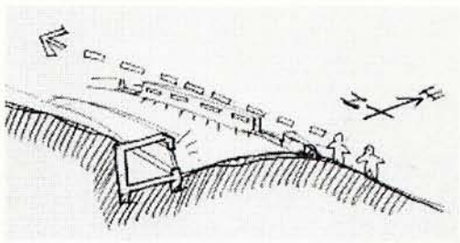
LIGHTING - ENVIRONMENTAL

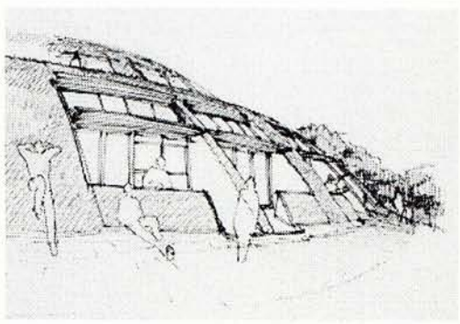
Control of light spill

Lighting is an important issue to be considered especially during night time. The most important issue is to control the **light spill**.

Using existing topography - To avoid light affecting night time stellar observing activities, the functional areas with tendency to give out lights are zoned to the west facing slope. The night time functions located on the east facing slope are designed to integrate with landscape so that people laying on the lower portion of the slope can hardly see the light from the buildings.

Low-pressure sodium down light - To control light spill affecting nake eye star gazing on the east facing slope, lighting fixtures are designed to direct its light downwards to ground and exhibits. In addition, low-pressure sodium light bulbs are used instead of normal tungsten light bulbs which waste up to 98% energy to heat.



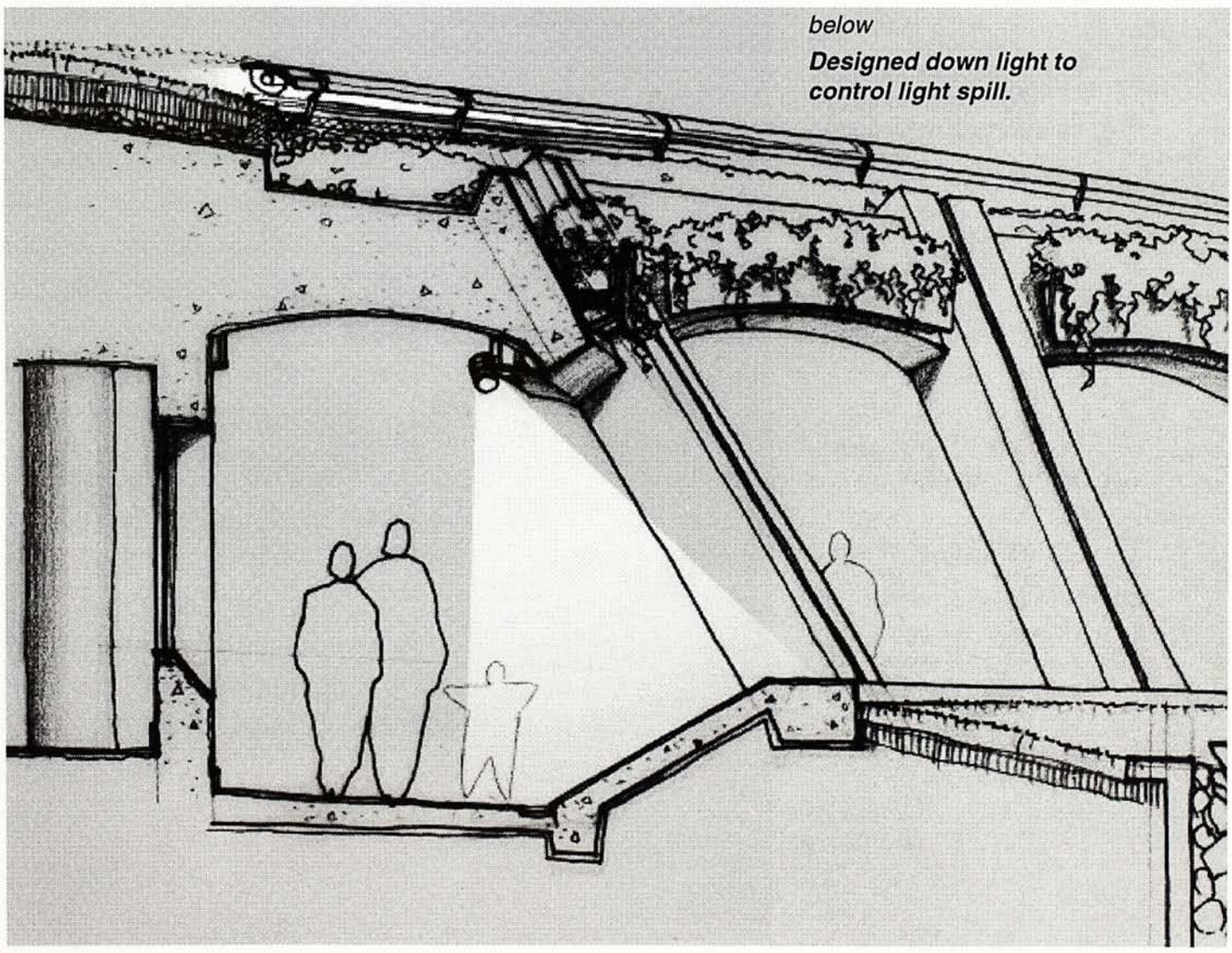


top

Section of building is designed to be hidden away from view below.

above

Undulating accommodation groups reduce light gives out to east facing slope.



below

Designed down light to control light spill.

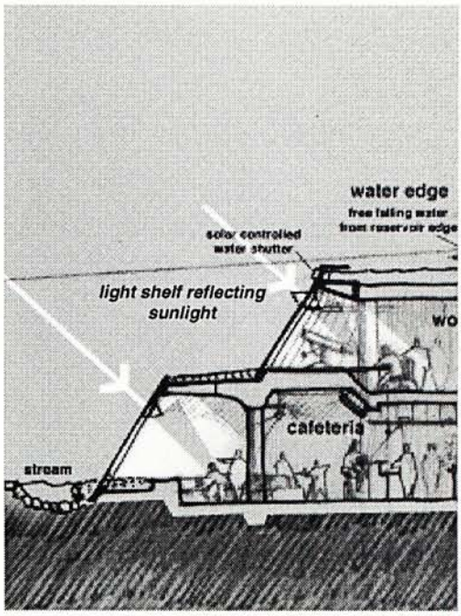
LIGHTING - ENVIRONMENTAL

Integrating sunlight

Lighting is used as an architectural element throughout the sequence of the museum. Along the path is the play of darkness, artificial lighting and occasional natural lighting to create different atmosphere.

Bringing daylight into interior - Along the upper part of the glazing of caferteria, workshop and star gazing classroom, a row of light shelves are installed to bring light more into the interior space.

Controlling solar gain - As the major glazing areas are along the eastern and western sides of the museum, solar gain has to be controlled. For the large glazing, low-e coating strengthened glass is used to allow visible light penetration while limiting invisible infra-red radiation penetration. Furthermore, water running down along the west facing glazing of cafeteria and workshop serves as sunscreen which can also reflect out portions of the solar radiation.

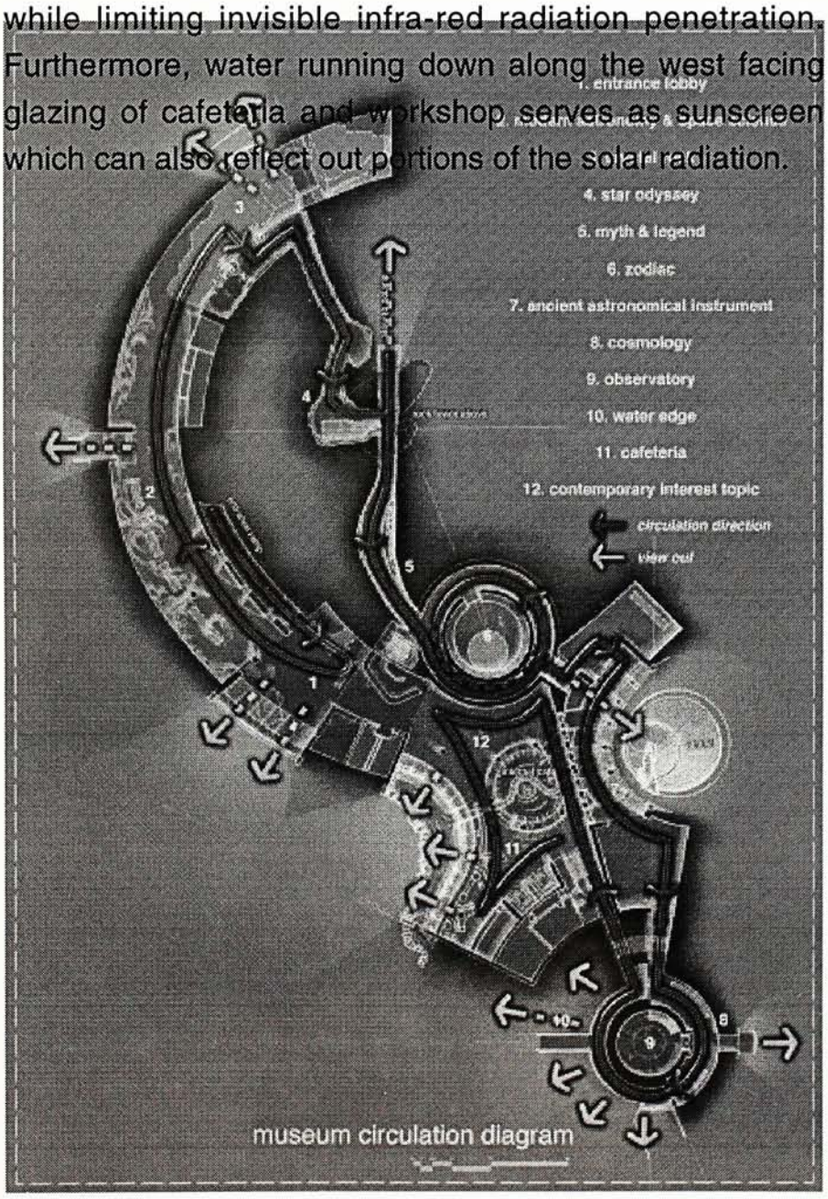


above

Light shelves are integrated along the large glazing to allow deeper daylight penetration.

left

Museum sequence with occasional sunlight penetration and view to outside.



NATURAL VENTILATION - ENVIRONMENTAL

Cross ventilation of accommodation modules

Cross ventilation is designed in the accommodation modules to reduce energy consumption for HVAC systems. There is always refreshing onshore sea breeze blowing from the east. Because of the thermal properties of water, the wind is cool during summer while warm during winter.

Cross ventilation is enabled naturally by the undulating profile which creates positive pressure along the accommdation glazing and negative pressure on the outlet on the back. Mechanical ventilation systems are also integrated to assist ventilation when needed.

Ventilation in other places

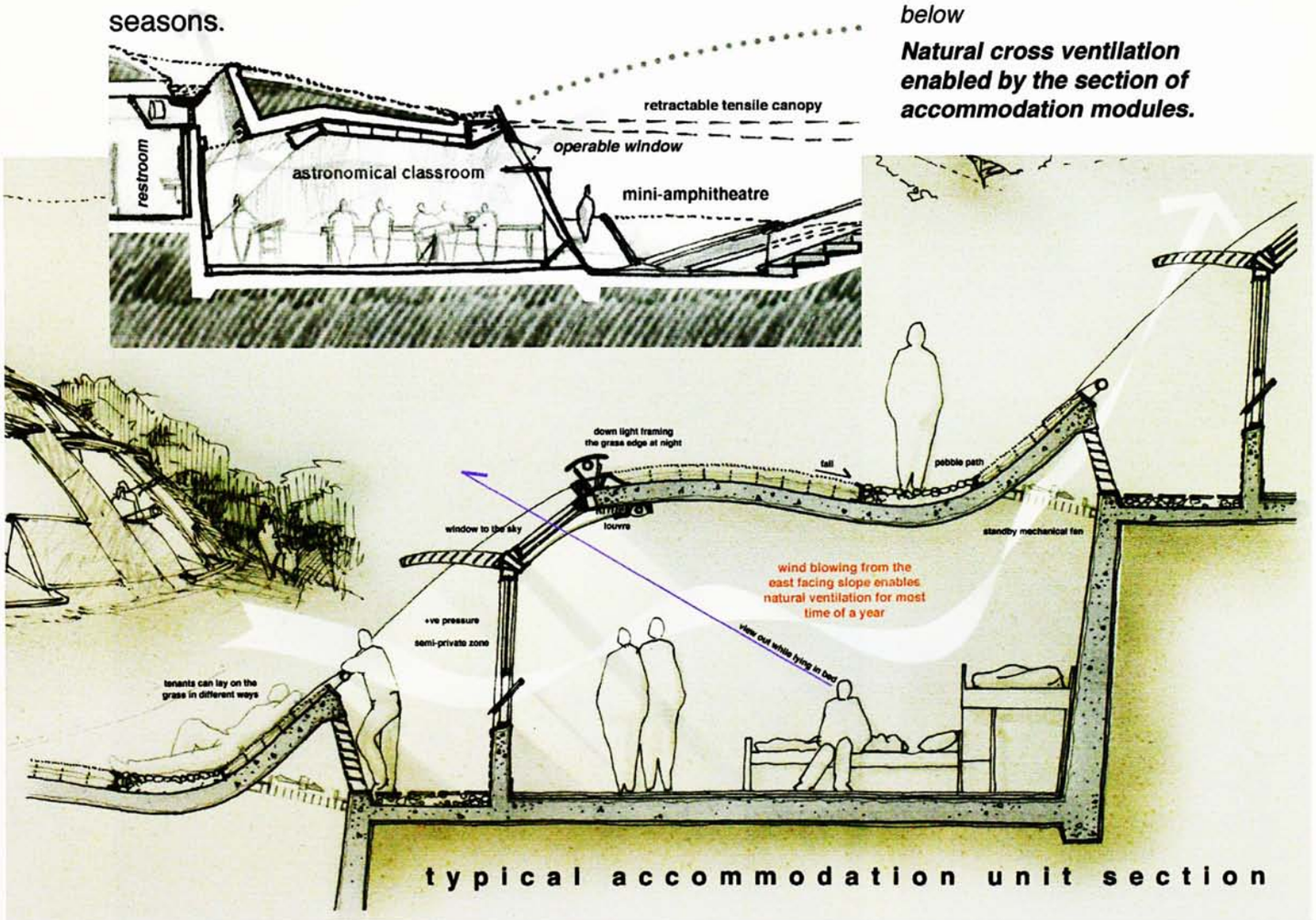
Because of the functional need, other spaces like museum, cafeteria, classroom and workshop require air conditioning during hot humid seasons. Nevertheless, natural / mechanical assisted ventilation is provided for suitable seasons.

left

Mechanical assisted ventilation across the classroom.

below

Natural cross ventilation enabled by the section of accommodation modules.



HVAC SYSTEM - ENVIRONMENTAL

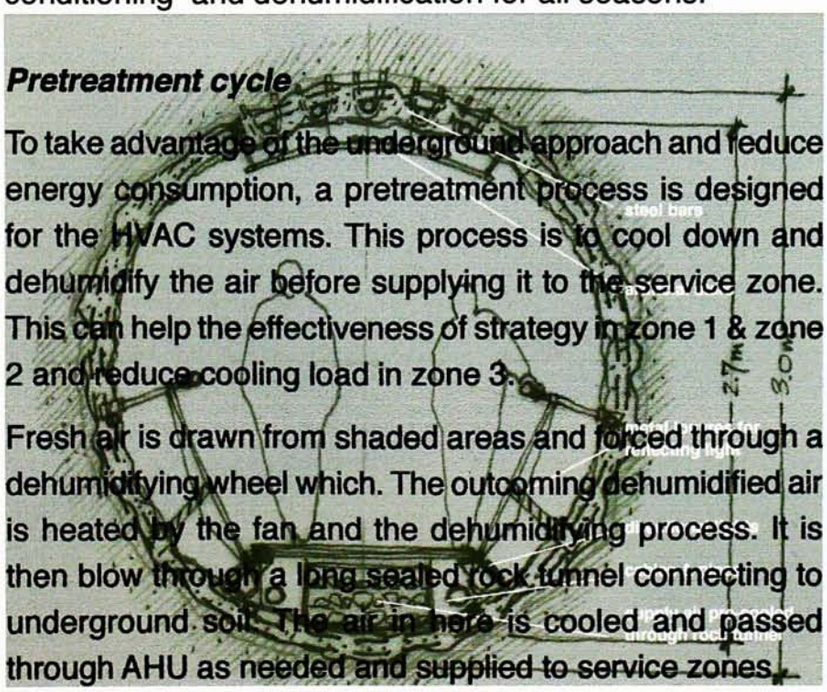
When considering energy conservation, HVAC systems are the major areas of concern. By careful initial planning, significant amount of power consumption can be reduced.

To critically apply air conditioning, different functional spaces are divided into zones with different requirements.

Zone 1 and zone 2 are the museum spaces, with the underground approach, intensity of solar gain is reduced. In addition, density of visitors in each part of the museum is anticipated to be very low. As a result, the control of temperature is not a critical concern while ventilation and air humidity are the major considerations.

Zone 3 is the area where reception, sovenoir shop and internet cafe are located. In addition, the cafeteria and contemporary interest topic are the areas where visitors stay and discuss. As a result, high degree of air conditioning and dehumidification is required as paper work and computers are found within the zone.

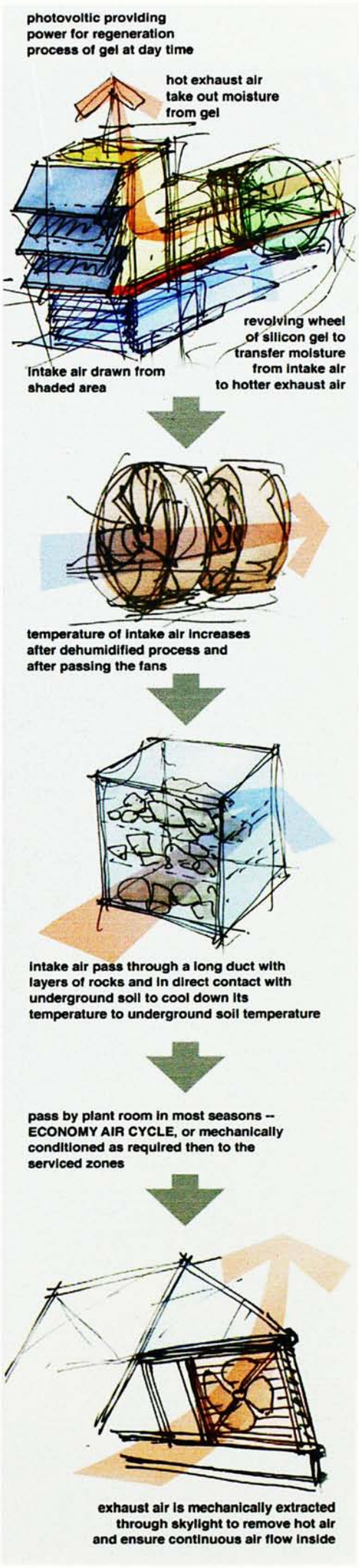
For the different requirements, zone 1 and zone 2 are provided with pretreated mechanical ventilation only for the whole year- Economy Air Cycle. Mechanical air conditioning are provided as backup for the two zones during critical seasons. It can significantly reduce the power consumption. Because of the high demand, zone 3 is provided with air conditioning and dehumidification for all seasons.



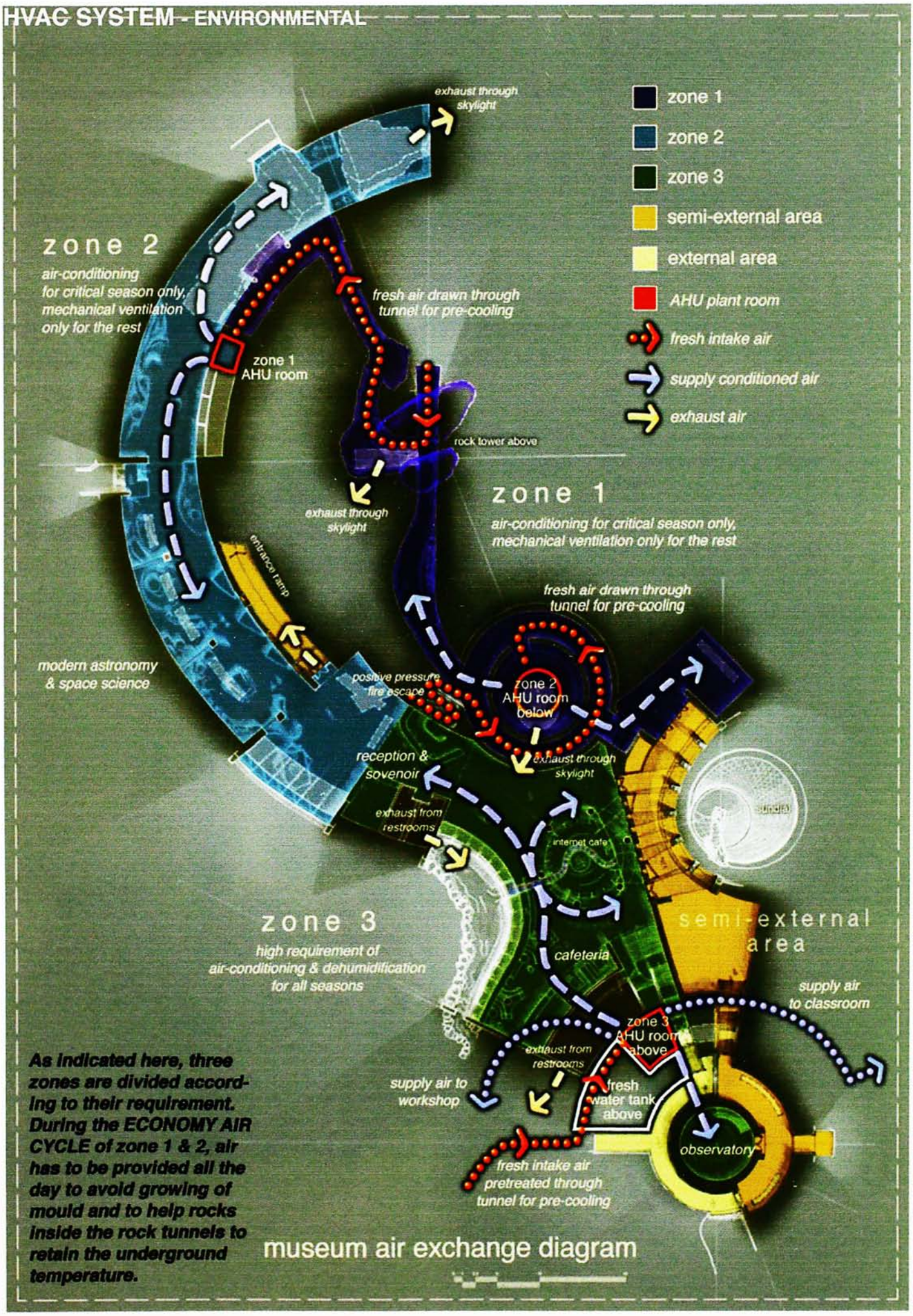
Pretreatment cycle

To take advantage of the underground approach and reduce energy consumption, a pretreatment process is designed for the HVAC systems. This process is to cool down and dehumidify the air before supplying it to the service zone. This can help the effectiveness of strategy in zone 1 & zone 2 and reduce cooling load in zone 3.

Fresh air is drawn from shaded areas and forced through a dehumidifying wheel which. The outcoming dehumidified air is heated by the fan and the dehumidifying process. It is then blow through a long sealed rock tunnel connecting to underground soil. The air in here is cooled and passed through AHU as needed and supplied to service zones.



HVAC SYSTEM - ENVIRONMENTAL



As indicated here, three zones are divided according to their requirement. During the ECONOMY AIR CYCLE of zone 1 & 2, air has to be provided all the day to avoid growing of mould and to help rocks inside the rock tunnels to retain the underground temperature.

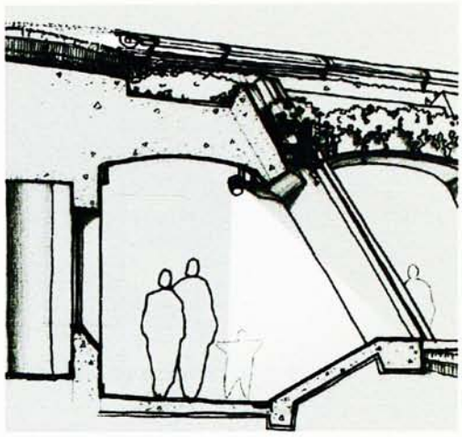
PLUMPING & DRAINAGE - ENVIRONMENTAL

Fresh water supplies and drainage

As descussed in the section "energy free fresh water supply" (p. 86), fresh water is supplied from the stream source in the south of the site. With water's own potential energy difference, water is pumped up to the reservoir and treated to fresh water tank. In addition, rain water is collected in the reservoir.

Sprinkler and fire services - Besides decorative purposes, water collected in the reservoir serves as the supply of sprinkler and fire services systems. It is connected to the fire services pipes inside the building.

Water drainage - Fresh water is supplied to restrooms, kitchens and bathrooms in the complex from the consealed fresh water tank under the reservoir. Used fresh water together with used flushing sea water, is drained to independent **septic tank** for treatment before discharging to the sea. Rainwater is collected by the floor drain along the edge to prevent water from flowing over directly.

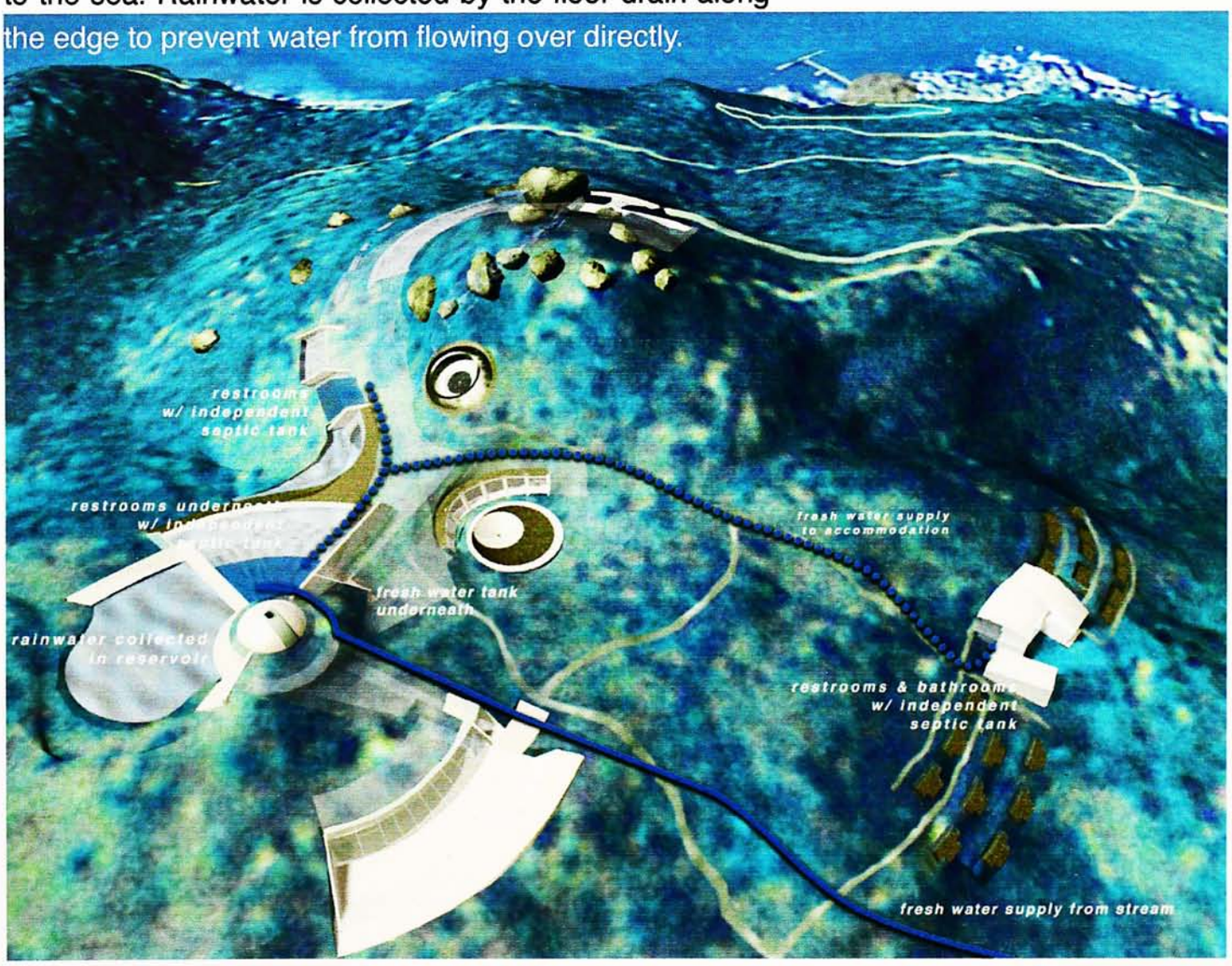


above

Drains are designed along the edge of building top and decorated by pebbles cover.

below

Fresh water supplies and drainage systems



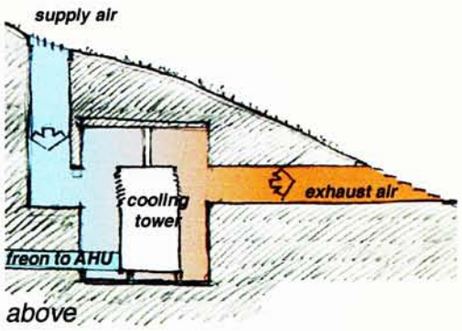
PLUMPING & DRAINAGE - ENVIRONMENTAL

Sea water cycle

If air cooling is used in the HVAC system, a separate room housing the cooling tower with louvres for intake air and exhaust air have to be provided for each zone. This will inevitably create more unpleasant scares on the landscape. After discussing with the consultants, other approaches may have to be taken.

Fresh water cooling too wasteful - The agent for cooling down the plants cannot be recycled, otherwise the temperature of the agent will build up and the cooling effect will be lost. As a result, using the fresh water from reservoir as the cooling agent for the plants is too wasting. Furthermore, if fresh water has to be used, it has to be pretreated to avoid the growing of bacteria.

Sea water cooling - As descussed in the section "photovoltics in pumping water up" (p. 84), sea water is finally used in cooling the AHU plants as sea water is abundant. In the use of sea water, cooling tower is no longer required and the sea water is just applied to the AHUs for cooling. The intake and discharge of sea water have to be separated and the supply of sea water has to be continuous.

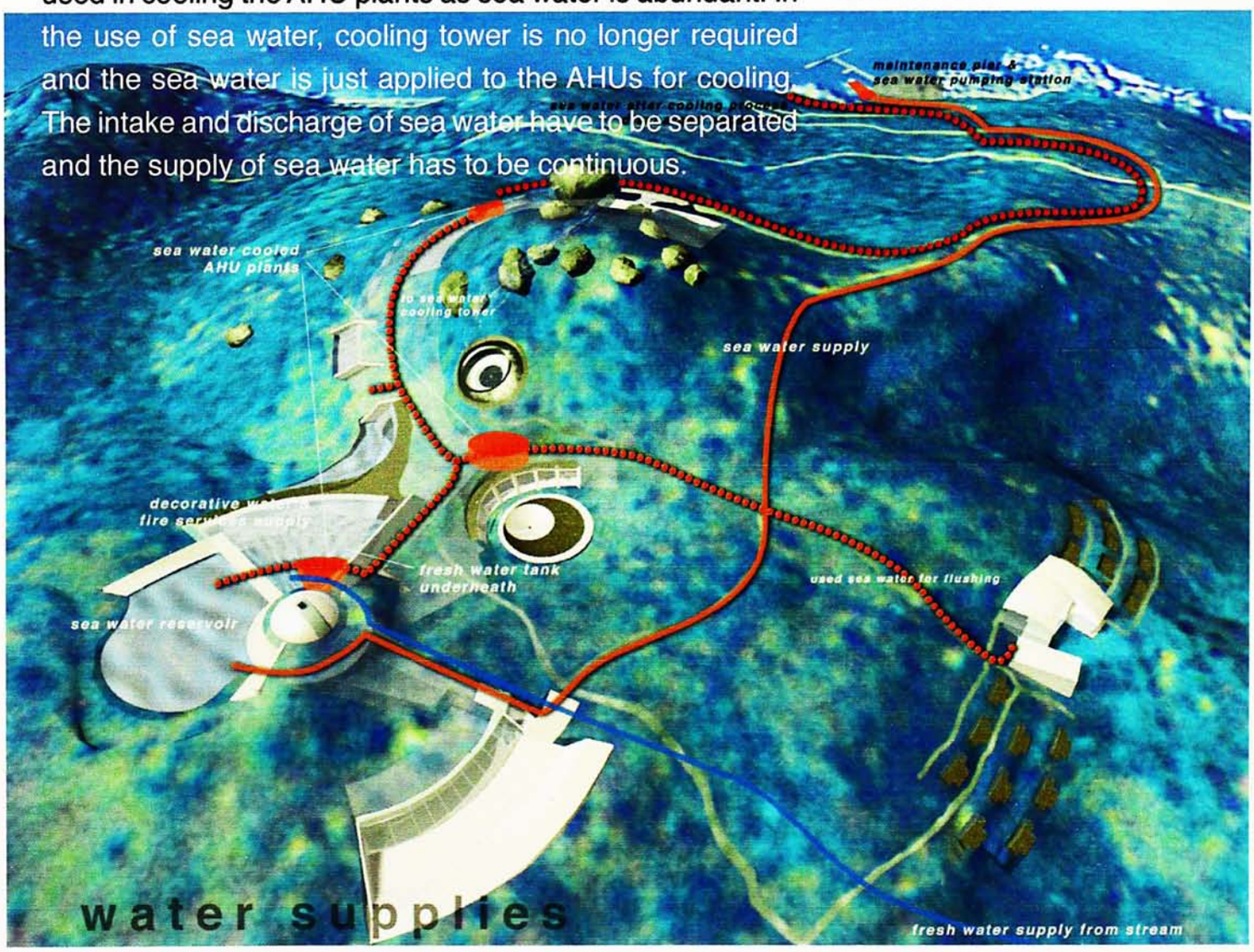


above

Air cooling system diagram.

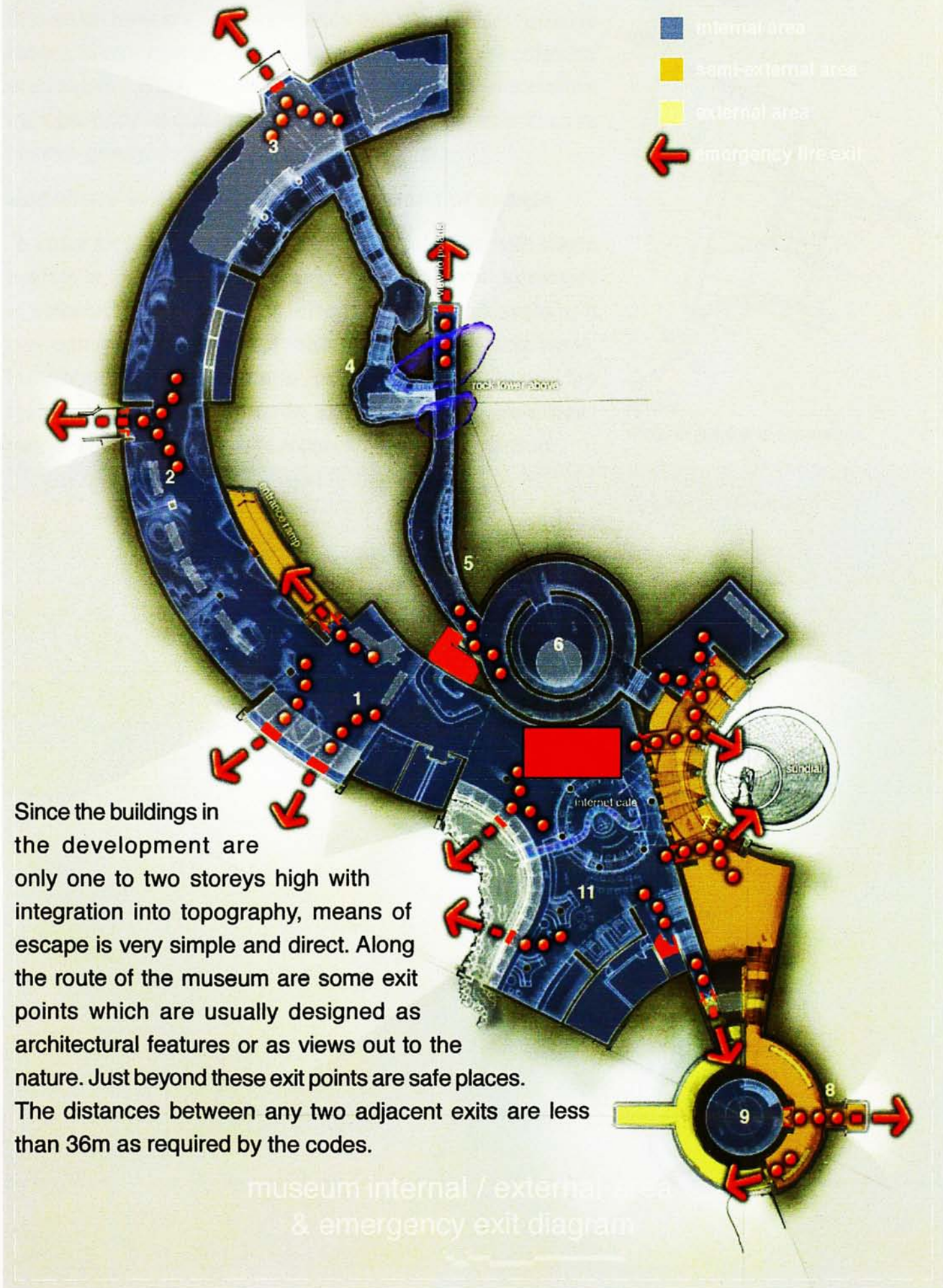
below

Proposed sea water cycle. Sea water pumped from maintenance pier up to an intermediate sea water tank under reservoir, is delivered to the three AHU plants. Sea water after cooling process is stored for flushing in restrooms which will be drained to septic tanks. The extra sea water will be discharged on the western side of maintenance pier as sea water normal flows from the east.



MEANS OF ESCAPE - LIFE SAFETY

Emergency fire exit



museum internal / external area & emergency exit diagram

Since the buildings in the development are only one to two storeys high with integration into topography, means of escape is very simple and direct. Along the route of the museum are some exit points which are usually designed as architectural features or as views out to the nature. Just beyond these exit points are safe places. The distances between any two adjacent exits are less than 36m as required by the codes.

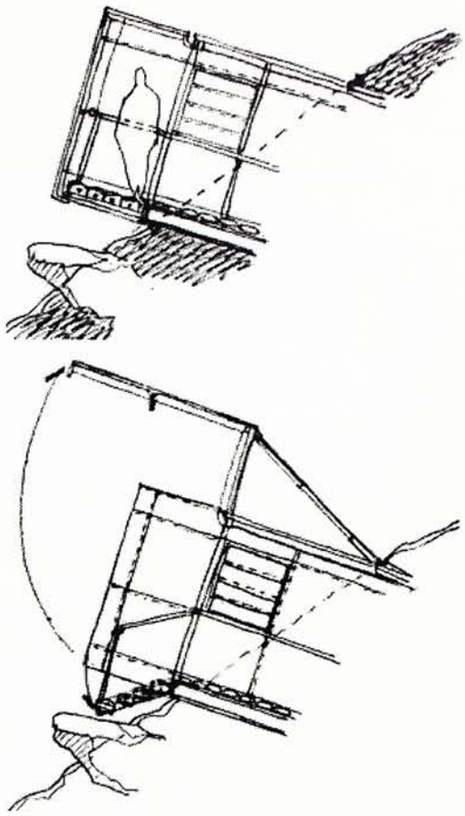
MEANS OF ESCAPE - LIFE SAFETY

Details of Emergency exit

Shown on here are two emergency exit mechanism: **polaris tube** and **emergency exit glazing panel** along the cafeteria enclosure. Both of these are to provide maximum transparency to outside view while being operable in case of emergency.

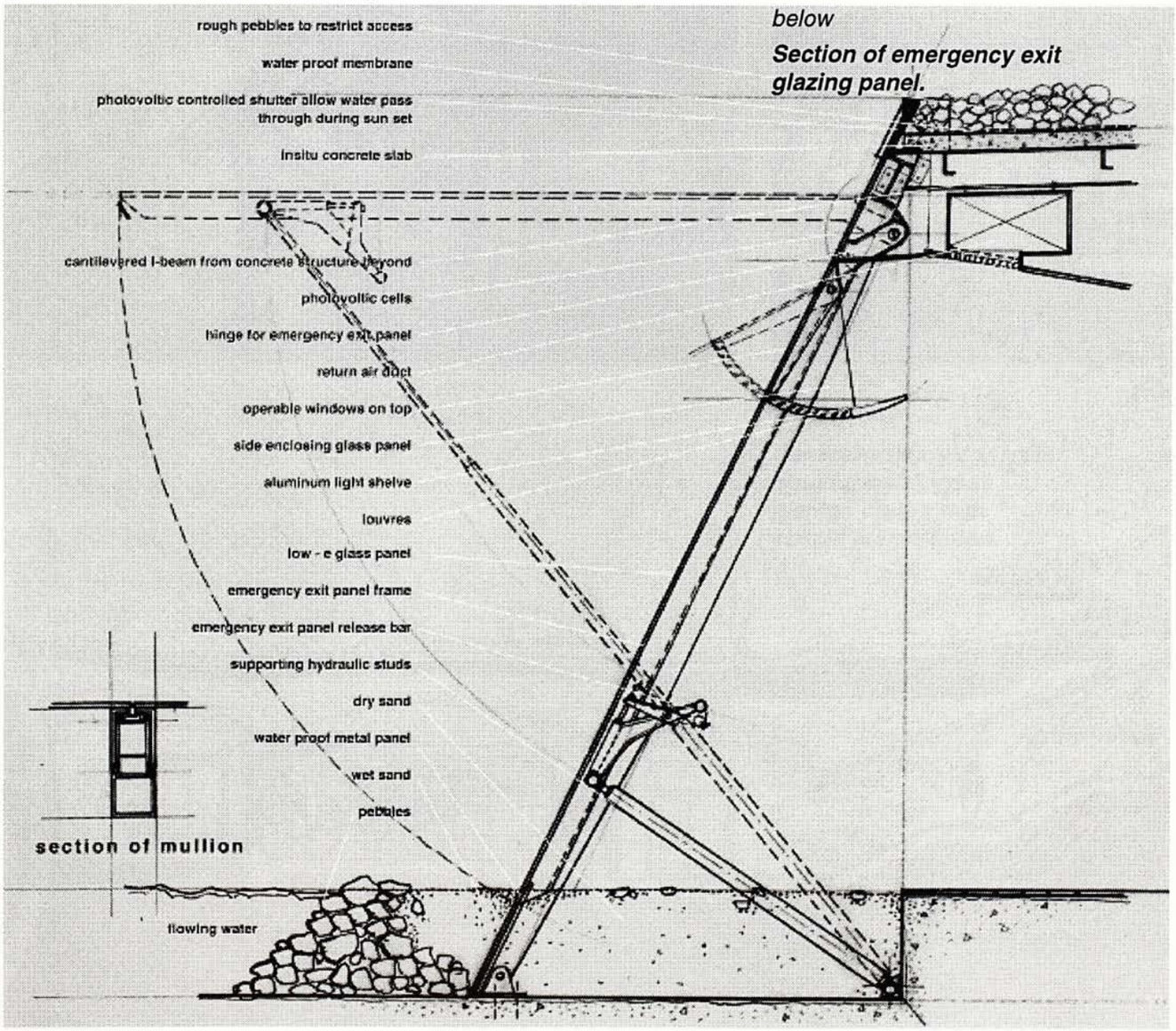
Sprinklers system & pressurized means of escape

To cater for fire suppression, sprinklers together with alarm system is to be provided. **Long throw side wall sprinkler** is selected with the use of **infra-red detection** system. It can control the location of the systems to the side walls. Furthermore, the two escape routes of polaris tube and fire stair next to zodiac are used as **intake air pretreatment paths** so that it can create a pressurized escape route.



above
Polaris tube's mechanism.

below
Section of emergency exit glazing panel.



GENERAL STRUCTURE - CONSTRUCTION

Because of the simple form and low rise of the building, simple onsite concrete structure is used as primary structure and substructure. This can restrict the size of construction material transported to the site and enable construction with small size equipment.

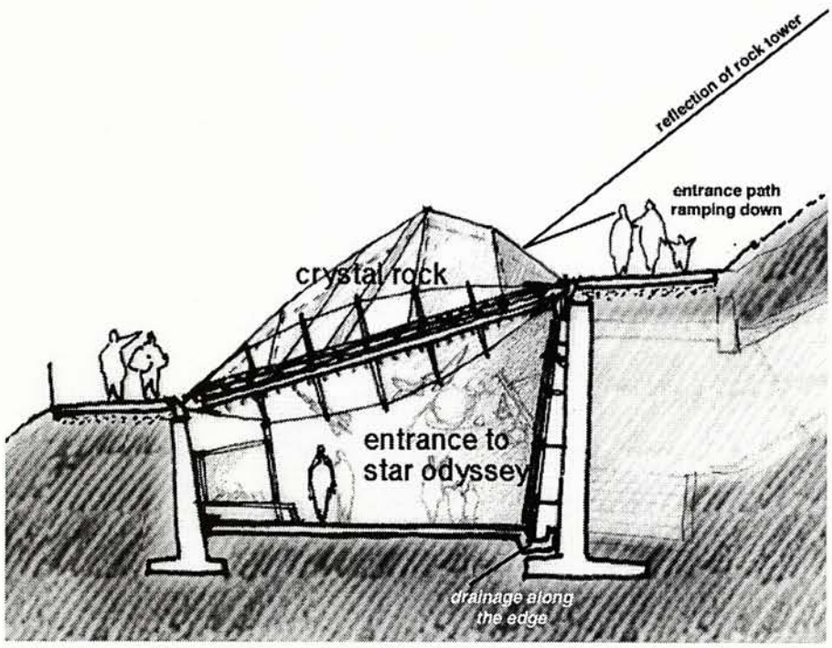
The general primary structure consists of concrete columns and concrete shell as roof. As the form is organic, no rigid structural grid is defined. The maximum span of the concrete roof is restricted to about 10m.

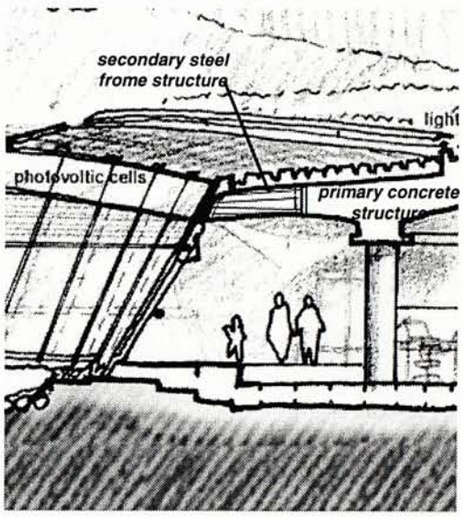
below

Section of cafeteria showing a concrete shell roof cantilevered from the central support of internet cafe. Secondary steel frames are attached to the side of the concrete structure from which glazing panels are attached.

left

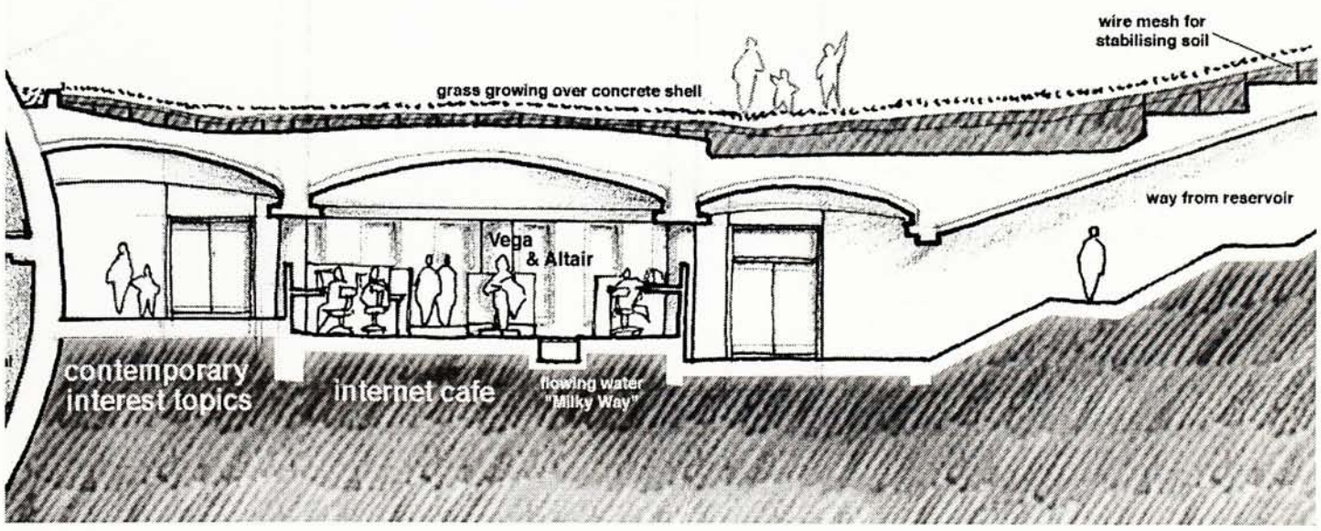
Concrete structure with concrete retaining wall on the side. Drainage is provided along the edge covered with interior finishing panels.





bottom

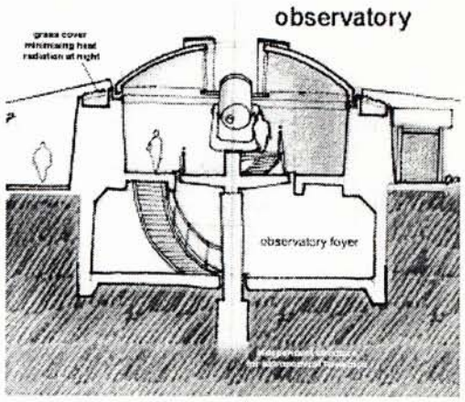
General primary concrete structure with grass planted on top with simple construction.



SPECIAL STRUCTURE - CONSTRUCTION

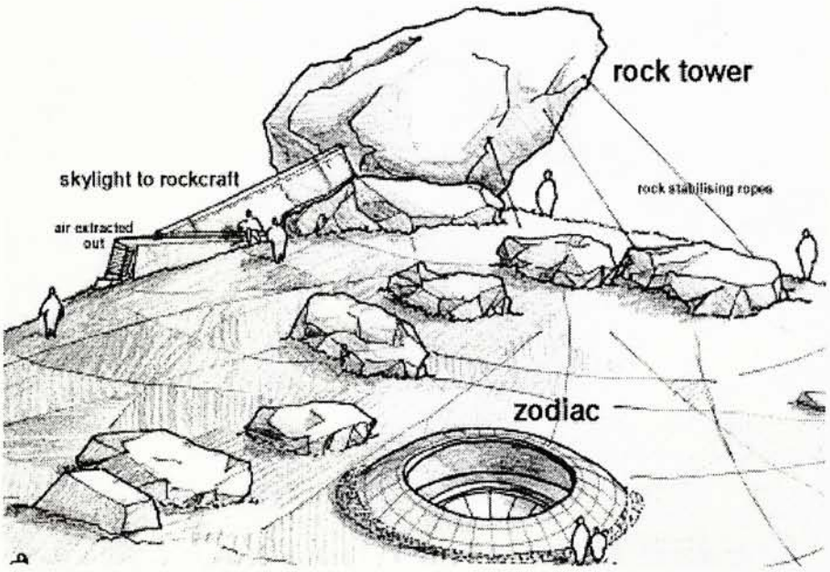
Besides the typical concrete structure, some parts of the development have different structures to meet their unique requirements or for aesthetic uses.

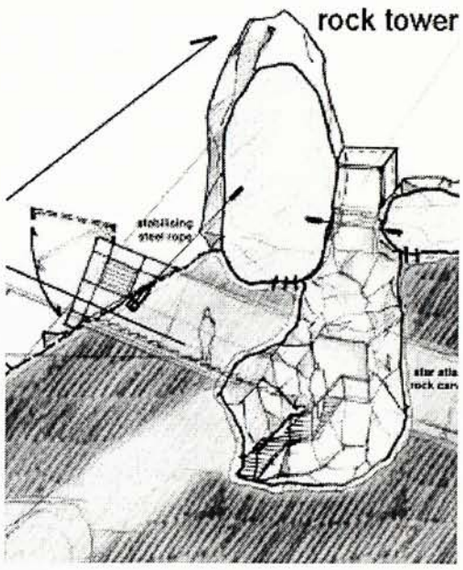
Rock tower is a major element that requires special considerations. Since the rock tower is freestanding on the site, structures stabilising the rock have to be installed to prevent it from falling down both during construction and after construction. Different methods have been considered with the major concern to have minimal visual impact on it. The final approach is to have some tensile ropes anchoring it to the surrounding ground and to connect it with the huge rock next to it. As a result, the array of light ropes help balancing and stabilising the rocks.

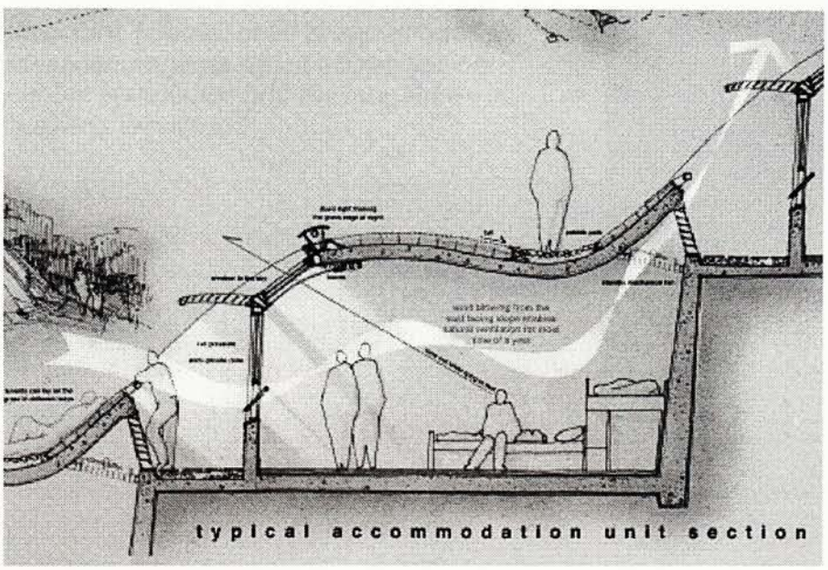


top

To avoid vibration in other spaces from affecting the astronomical telescope observation. The telescope together with its rotating platform are supported by an independent structure.





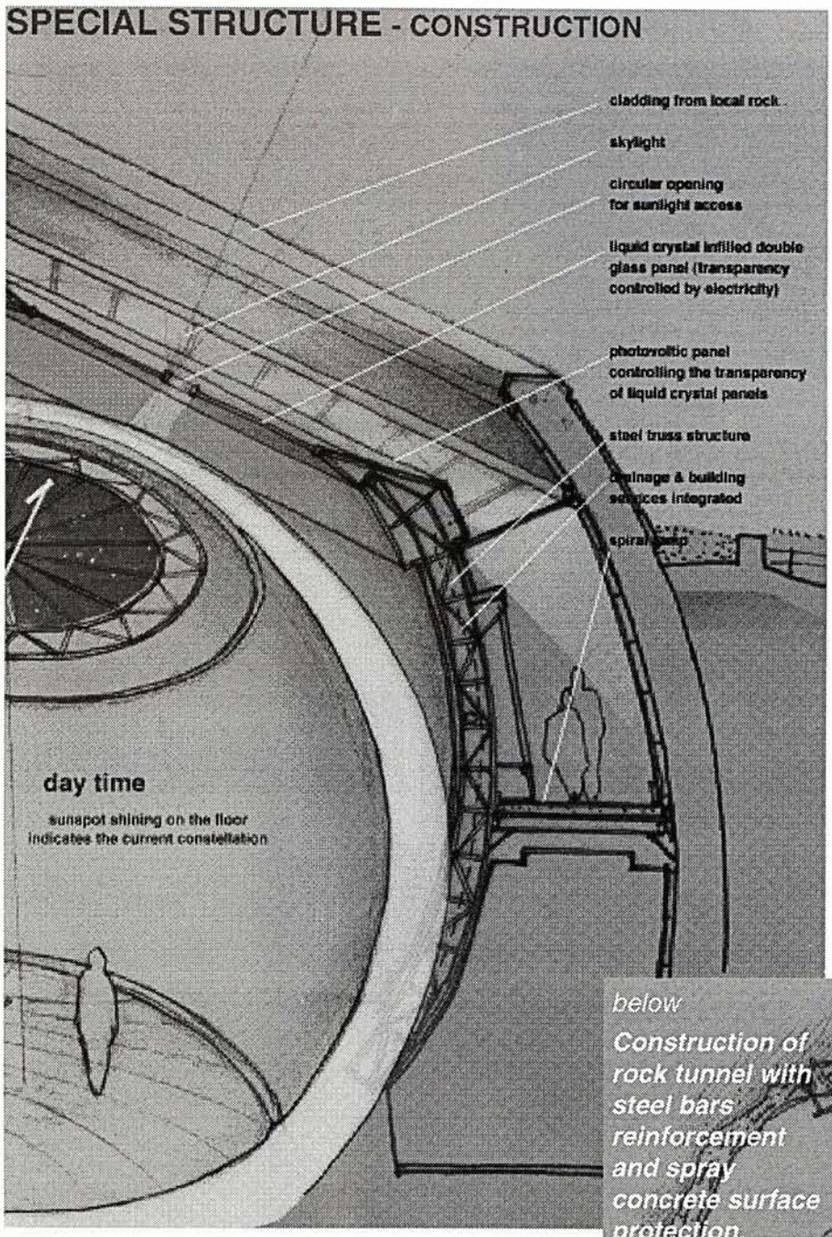


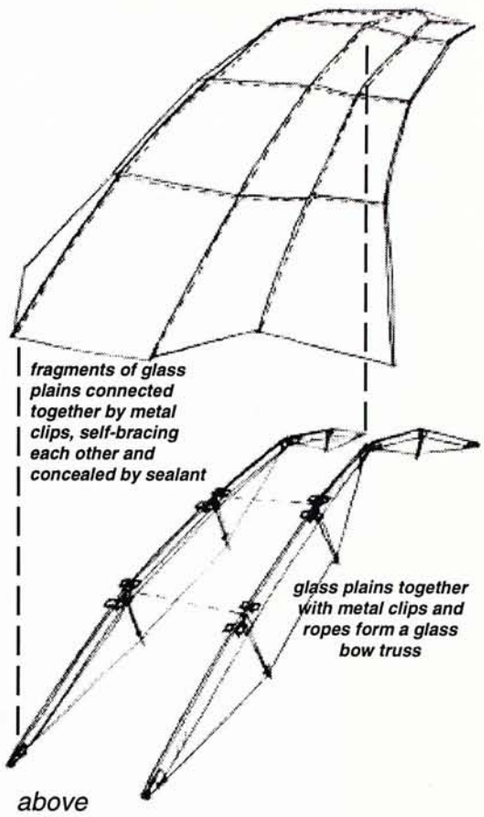
above

Rock tower and the side rock are stabilised by an array of light ropes.

left

Undulating accommodation units are previously designed as standardised modules to be constructed by prefabricated components. However, to make the modules more integrated into topography, onsite concrete construction is finally used with simple stepping substructure.



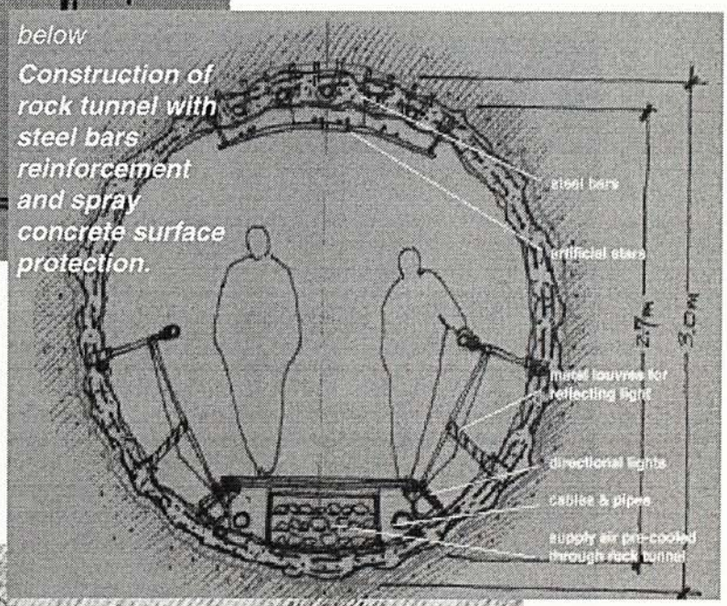


above

Assembly of crystal rock with primary "glass bow truss" support. The glass fragments are bracing and strengthening each other and connected together with metal clips and bolts.

below

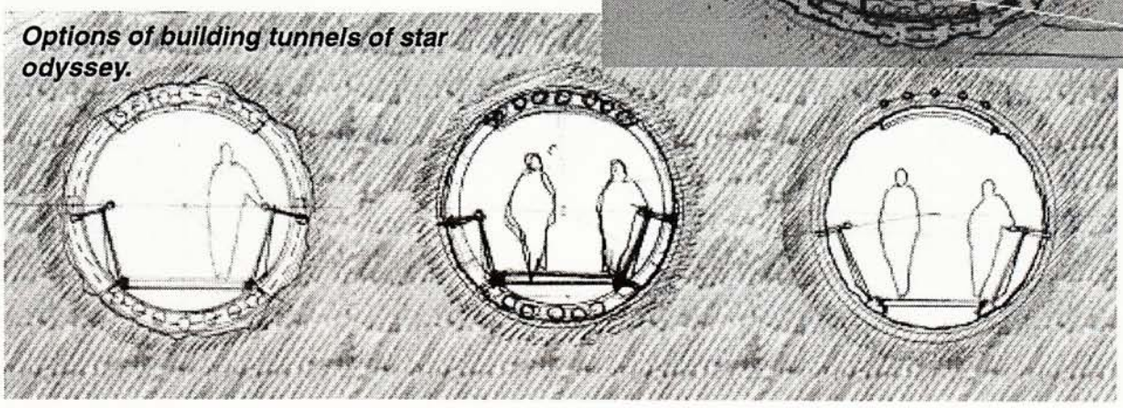
Construction of rock tunnel with steel bars reinforcement and spray concrete surface protection.



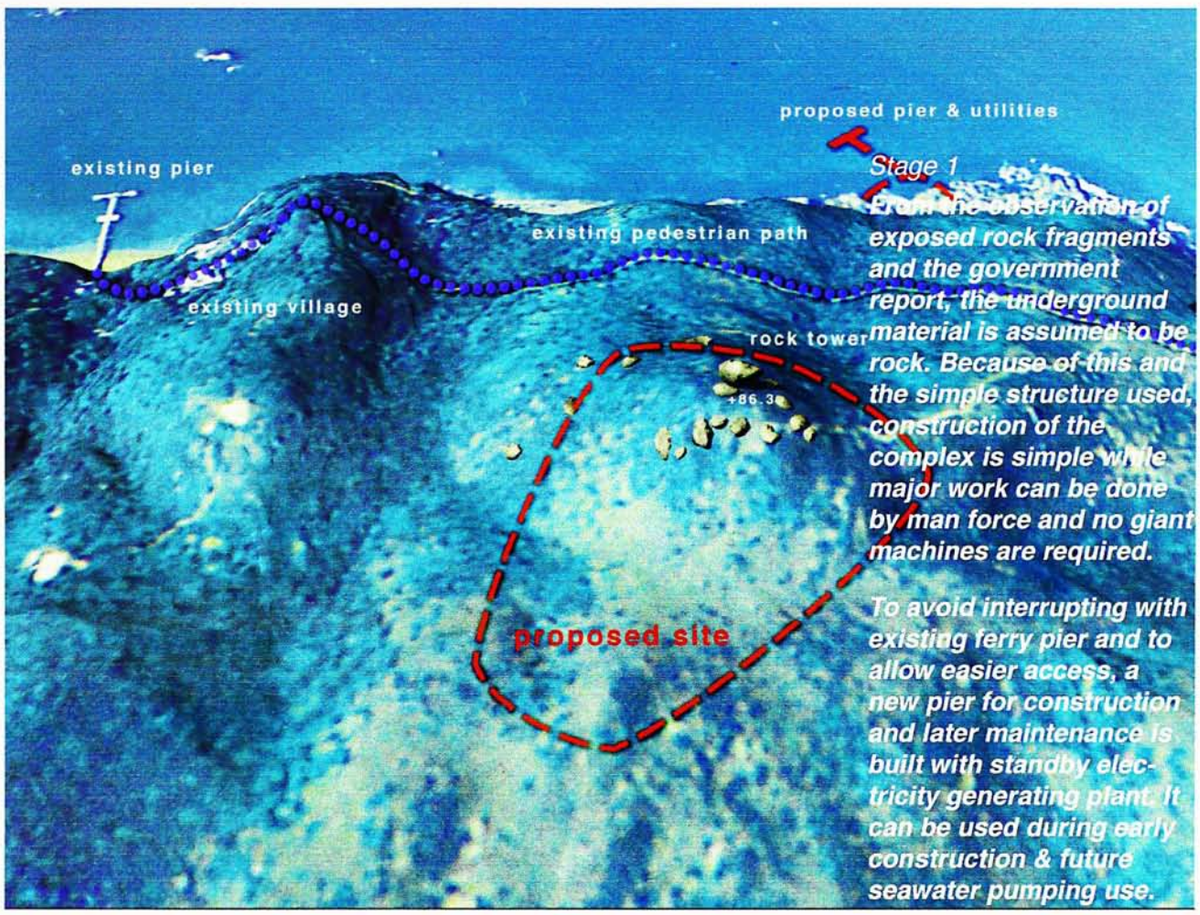
above

Zodiac constructed by two layers of shells. The external concrete shell forms a self rigid structure. Internal shell is constructed by steel components which allows flexible exhibit installation and the integration of building services.

Options of building tunnels of star odyssey.



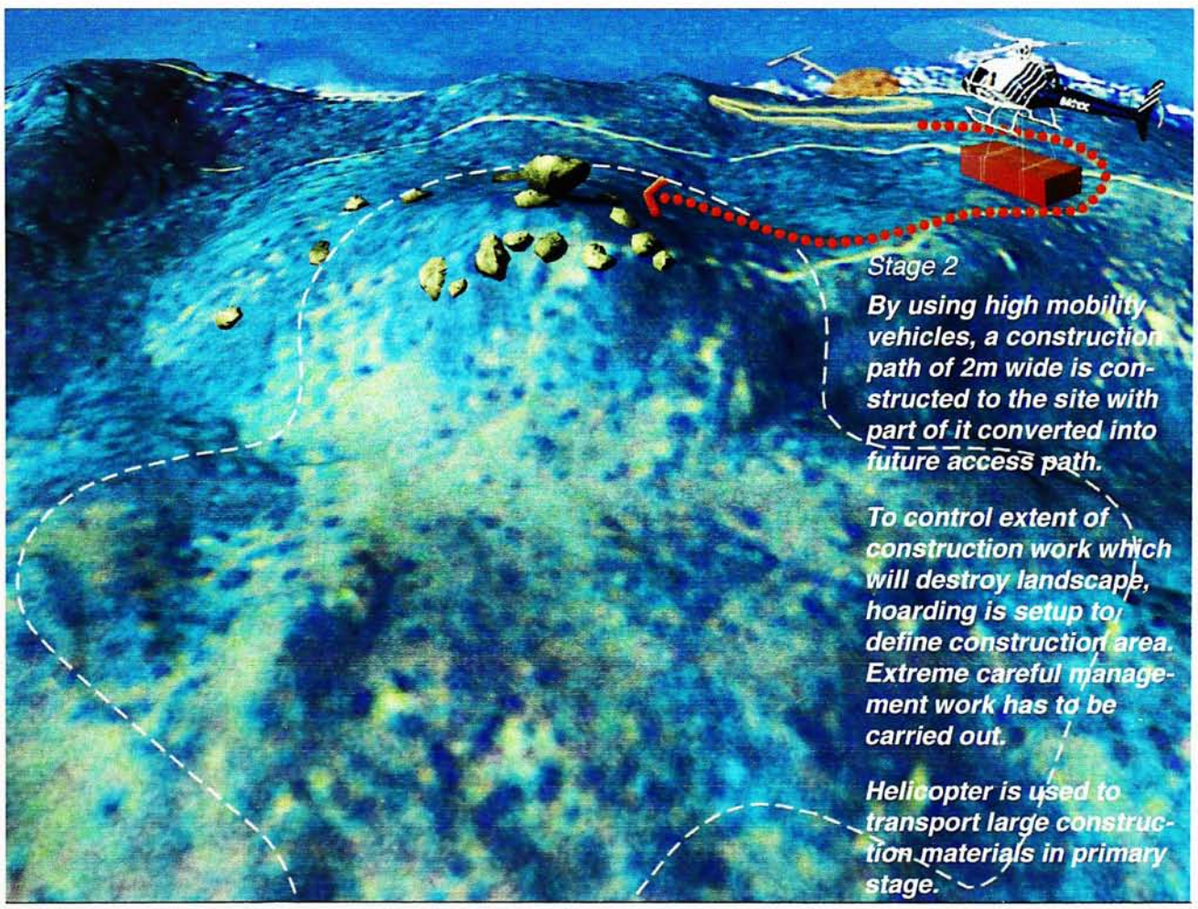
CONSTRUCTION SEQUENCE - CONSTRUCTION



Stage 1

From the observation of exposed rock fragments and the government report, the underground material is assumed to be rock. Because of this and the simple structure used, construction of the complex is simple while major work can be done by man force and no giant machines are required.

To avoid interrupting with existing ferry pier and to allow easier access, a new pier for construction and later maintenance is built with standby electricity generating plant. It can be used during early construction & future seawater pumping use.



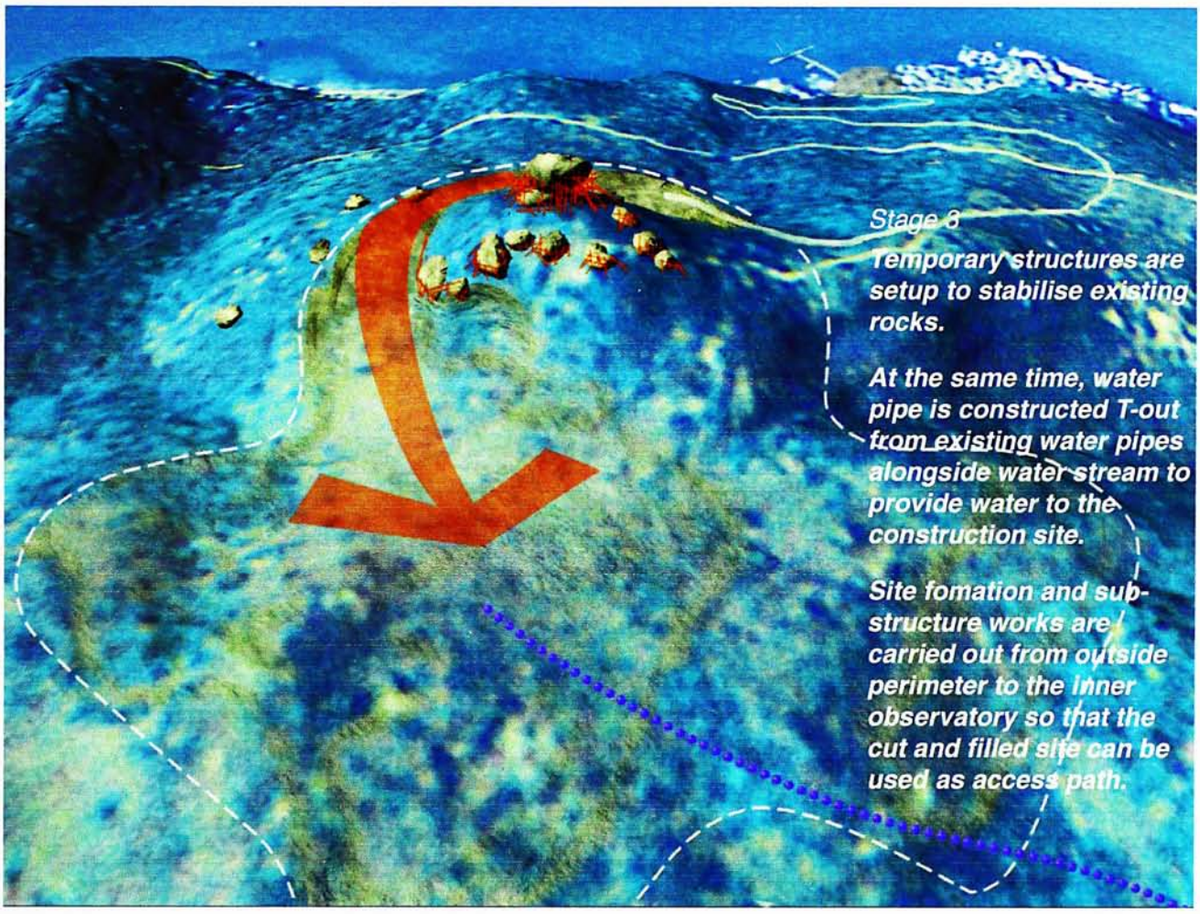
Stage 2

By using high mobility vehicles, a construction path of 2m wide is constructed to the site with part of it converted into future access path.

To control extent of construction work which will destroy landscape, hoarding is setup to define construction area. Extreme careful management work has to be carried out.

Helicopter is used to transport large construction materials in primary stage.

CONSTRUCTION SEQUENCE - CONSTRUCTION

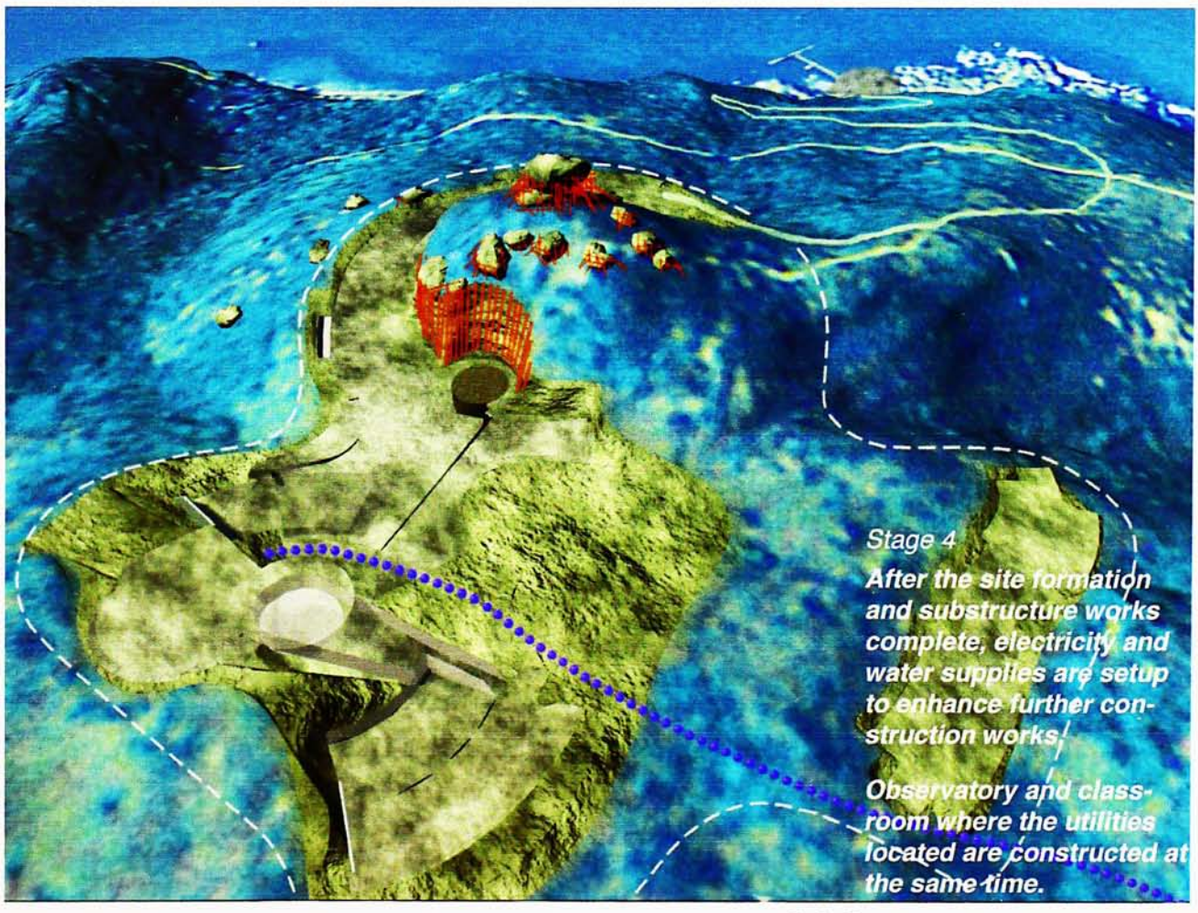


Stage 3

Temporary structures are setup to stabilise existing rocks.

At the same time, water pipe is constructed T-out from existing water pipes alongside water stream to provide water to the construction site.

Site fomation and sub-structure works are carried out from outside perimeter to the inner observatory so that the cut and filled site can be used as access path.

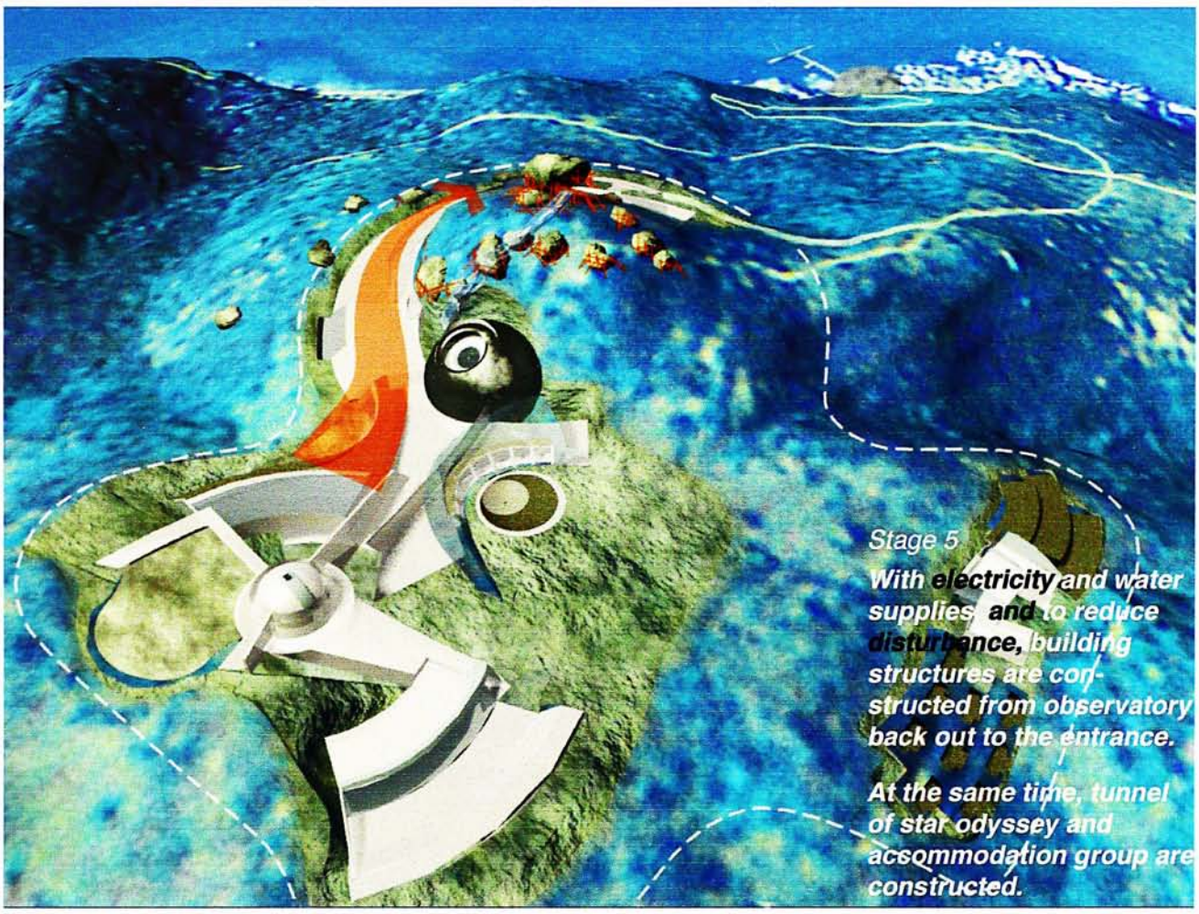


Stage 4

After the site formation and substructure works complete, electricity and water supplies are setup to enhance further construction works.

Observatory and classroom where the utilities located are constructed at the same time.

CONSTRUCTION SEQUENCE - CONSTRUCTION



Stage 5

With electricity and water supplies and to reduce disturbance, building structures are constructed from observatory back out to the entrance.

At the same time, tunnel of star odyssey and accommodation group are constructed.

Stage 6

After major building structures are finished, astronomical telescope is installed.

External work including landscaping, and interior finishes are carried out.

COST ANALYSIS - CONSTRUCTION

To estimate the building cost, the cost index from Davis Langdon & Seah Hong Kong Limited, 1st quarter 1993 is used. This cost index includes the mechanical and electrical installations but excludes furniture, loose or special equipment, and external works.

For the **museum** part, cost index for "*Local museums including iar conditioning*" is used : HK$7,700/m^2.

For the **workshop** and the **observatory** area excluding the dome shape observatory, cost index for "*University (science) buildings*" is used: HK$7,000/m^2.

For the **accommodation** part, cost index for "*Student/ nurses halls of residence*" is used: HK$4,500/m^2.

An inflation rate of 1.2% per month is assumed for the Hong Kong building cost and the tender price is based on year 2000 cost index. Therefore, there are 81 months difference and the cost index should be adjusted with the inflation factor of : (1.012)81 = 2.628

With the volumetrics indicated on page 35, the areas for the three major different zones are used. An additional 15% of the floor area should be considered in each item as the volumetrics haven't include M&E spaces.

Building cost for the museum:

HK$ 2,703 x 1.15 x 7,700 x 2.628
= HK$ 62.90 million

Buiding cost for the workshop & observatory:

HK$ (298 + 369 -50) x 1.15 x 7,000 x 2.628
= HK$ 13.05 million

Building cost for accommodation:

HK$ 821 x 1.15 x 4,500 x 2.628
= HK$ 11.17 million

COST ANALYSIS - CONSTRUCTION

According to an astronomical telescope supplier in the internet, the price for a 1 metre computer controlled astronomical telescope with dome shape observatory is about 1.4 million at 3rd quarter 1997. Since inflation rate of these technological equipment is very low, an inflation factor of 15% is assumed for the time of installation.

Cost for the astronomical telescope:

HK$ 1.4 million x 1.15

= HK$ 1.61 million

The total interior building cost for the complex:

HK$ (62.90 + 13.05 + 11.17 + 1.61) million

= HK$ 88.73 million

As the building is constructed on the natural slope and most parts of the complex are built under the landscape, these imply an extensive work of site formation and landscaping is required and a high level of management and coordination work are anticipated. In addition, amenities including electricity, photovoltic cells and reservoir have to be provided. With a low rise and simple structure design, the extra cost for these is assumed to be 80% of the building cost.

Total building cost should be:

HK$ 88.73 million x 1.8

= HK$ 159.71 million

Therefore the total building cost excluding site investigation is estimated to be HK$ 164 million.

photographer freezes an event at particular point of its existence

journalist reports the life of an incident

historian records the story of his time

anthropologist reconstructs the evolution of man

archaeologist digs out the ancient world

geologist investigates the tectonic drifts

astronomer searches for the origin of our universe

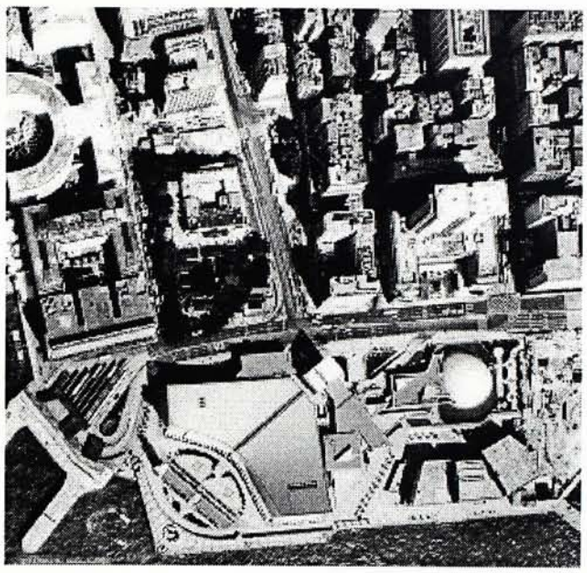
astronomy in fourth dimension

PRECEDENTS STUDIES - *HK facilities*

Hong Kong Space Museum

Architectural Services Department

10 Salisbury Road, Tsim Sha Tsui, Kowloon



Marking a striking landmark on the Kowloon peninsula, the well equipped high-tech 8000 m² Space Museum was operated by the Urban Council in 1980. It is the first stage of the three stage ambitious Cultural Centre complex project.

The Hong Kong Space Museum is the first government institution to popularize astronomy and space science in Hong Kong while at the same time providing educational entertainment to both young and old people. Facilities include planetarium projector and omnimax shows, exhibition halls, workshops and lecture hall.

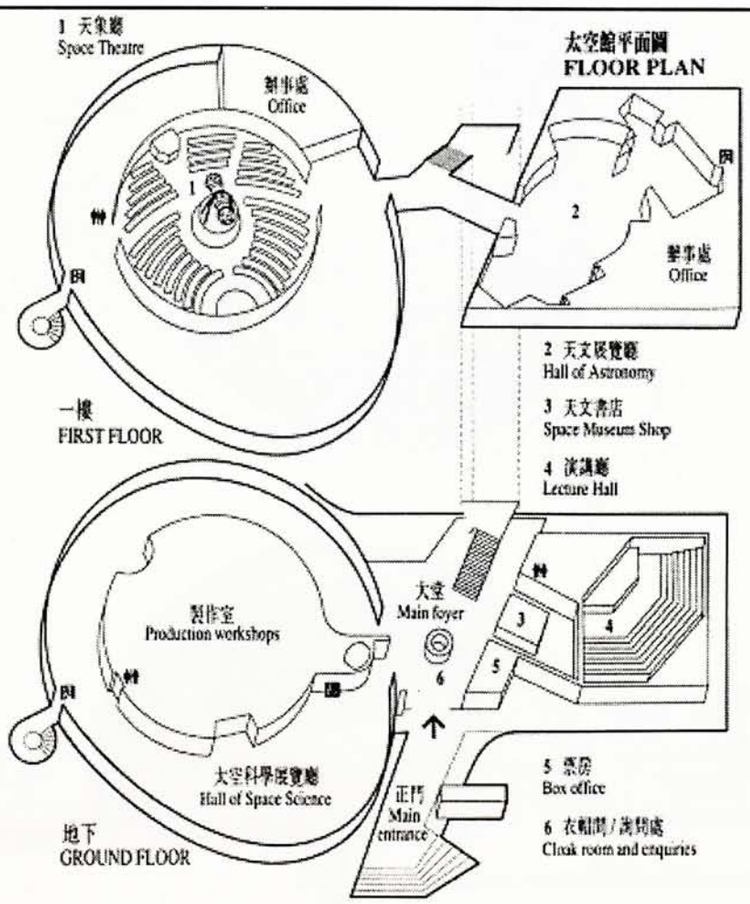
above

Aerial photo of the Cultural Centre complex

left

Exploded axonometric of the Space Museum

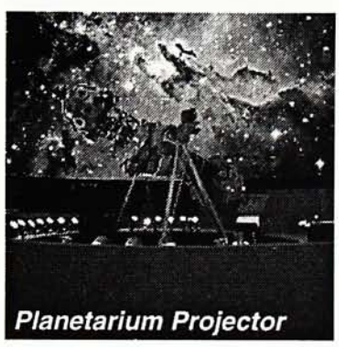
Mission: ***To create a sculptural landmark which popularize astronomy and space science through formal exhibits.***



Functional spaces

The museum consists of two wings. The eastern wing is the planetarium's nucleus with an egg-shaped dome structure. Beneath the dome are the Space Theatre, the Hall of Space Science and some workshops and offices.

A glass-enclosed foyer connects the eastern wing to the western wing which houses the Hall of Astronomy, the Lecture Hall and offices for curatorial staff.



Planetarium Projector

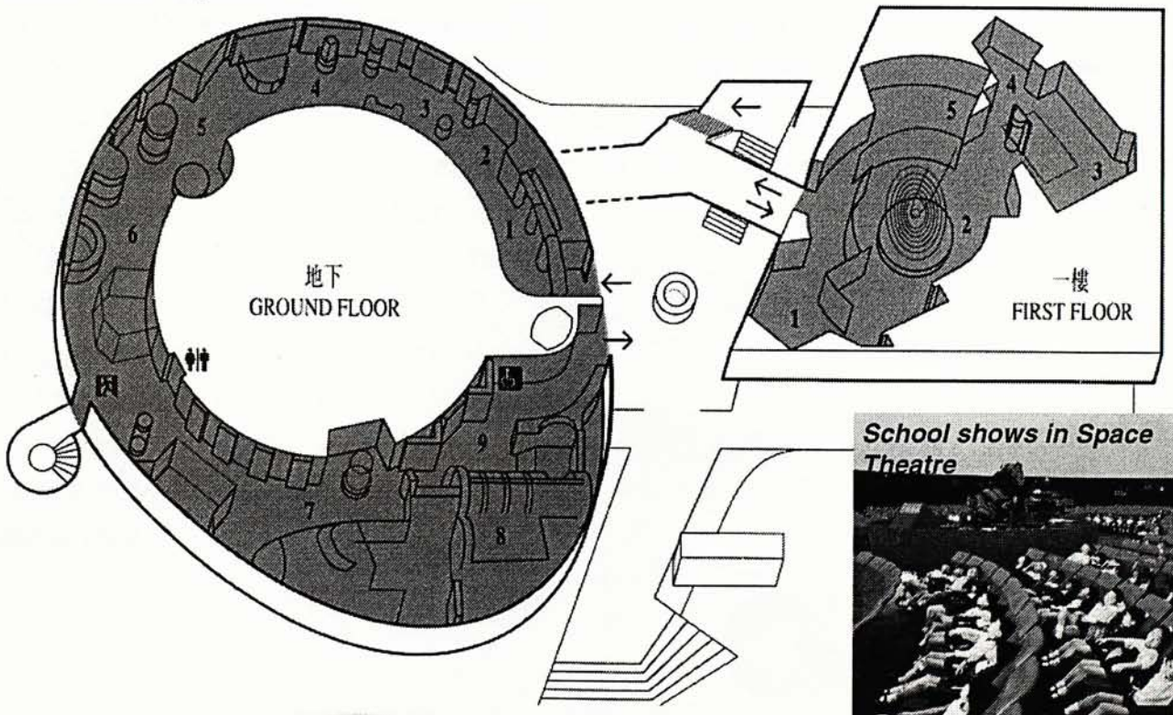
Hong Kong Space Museum

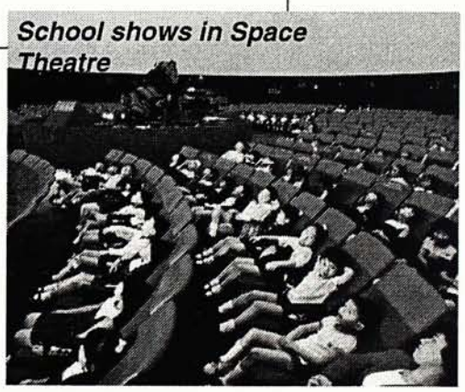

Multi-axis chair

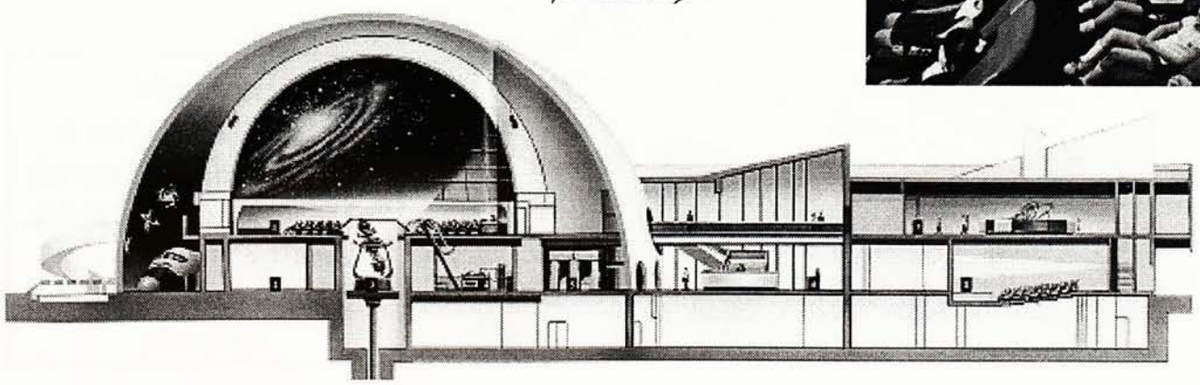
Planetarium - The huge egg-shaped dome is the most eye-catching feature of the museum. Immediately below this shell is the exoskeleton of the Space Theatre. This concrete dome with 28-metre diameter not only supports the inner perforated aluminium projection dome but also integrates the audio and air-conditioning systems. Within it houses a multi-million dollar planetarium projector from Carl Zeiss. It can project high precision celestial bodies motions and even simulate the solar and lunar eclipses. The projector's images enable the audience to appreciate the grandeur of the night sky.


Space Station Area

Exhibition halls - The Hall of Space Science and Hall of Astronomy adopt a graphical approach to promote knowledge on astronomy and space science to the public. Also, interactive exhibits are also incorporated to enable visitors to learn through a series of entertaining and educational experiences.




School shows in Space Theatre



PRECEDENTS STUDIES - ***HK facilities***

Ho Koon Nature Education cum Astronomical Centre

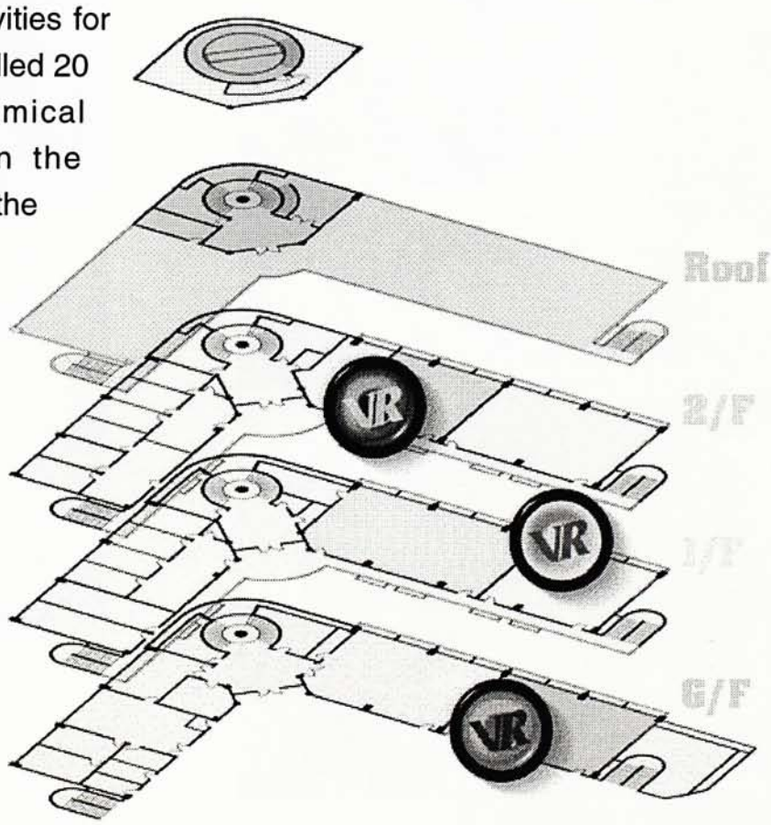
Tso Kung Tam, Tai Mo Shan Country Park, HK

Realising the insufficient facilities in Hong Kong for the Secondary six and seven students environmental studies, Sik Sik Yuen (a Taoist organization) conducted a discussion with Education Department, Agriculture and Fisheries Department and the Chinese University of Hong Kong. Sik Sik decided to establish the "Ho Koon Nature Education cum Astronomical Centre" to contribute to education in its 75th anniversary. The centre, occupying some 6860m^2 was purposely built and equipped for field studies and astronomical observations.

above
Exterior view of the centre

below
Plans of the centre

Major functional spaces within this three-storey building are: an exhibition room, a lecture room, a conference room and an office on the ground floor; a laboratory and a library on the first floor for environmental studies; a computer room and a workshop for astronomical studies on the second floor. The roof, equipped with a number of telescopes and a rubber-floored observation platform, are mainly for astronomical activities for students. A computer controlled 20 inch diameter astronomical telescope is mounted on the observation platform inside the astronomical dome on the upper roof.



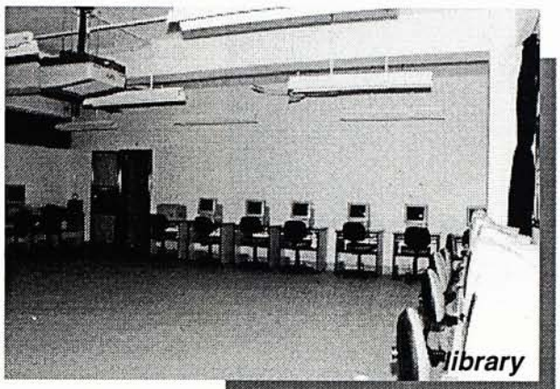
Mission:
A simple structure formal institution with advanced facilities for secondary school environmental studies.

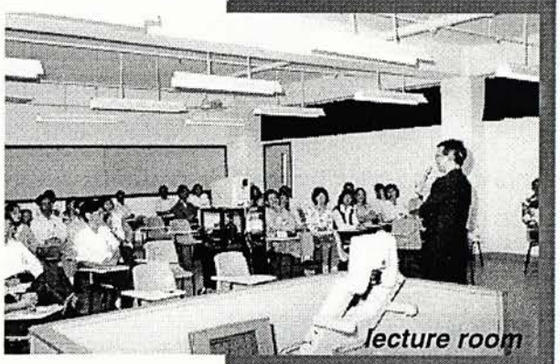
Ho Koon Nature Education cum Astronomical Centre

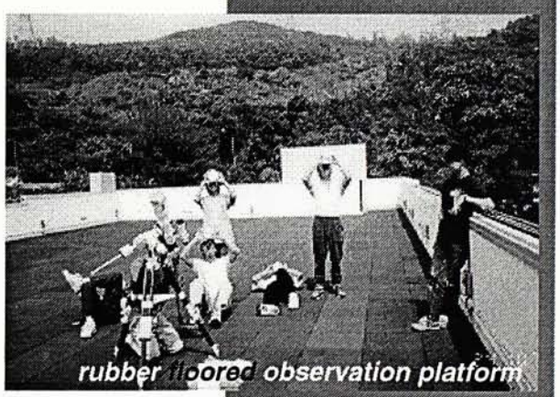
Activities conducted at Ho Koon

Field Studies - Weekly ecology / geography courses will be offered to S6 students. The courses are predominatly academic and forms an integral part of Advanced Level syllabuses for the local university.

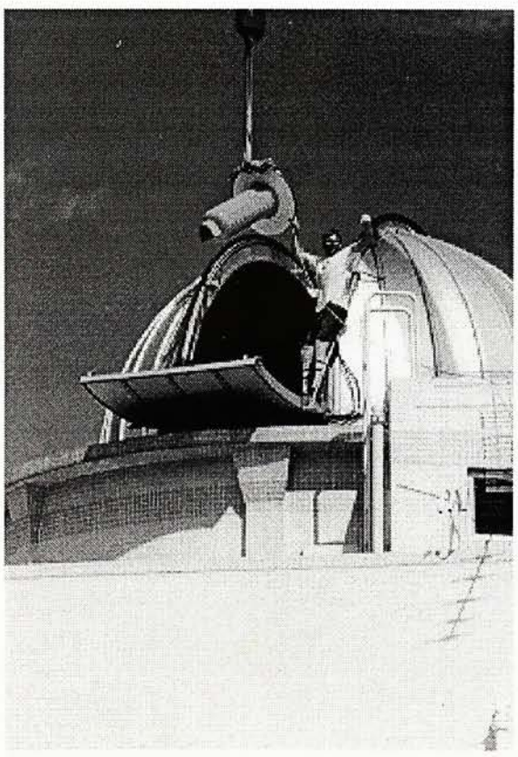
Secondary schools' Astronomical Clubs - The objective is to promote the students the awareness on the universe surrounding us. Astronomical activities sponsored by the Sik Sik Yuen in cooperation with the Hong Kong Astronomical Society are conducted to students all year round. These activities include lectures, use of different types of telescopes, sky watching, star gazing and making of astronomical equipment.


library


lecture room


rubber floored observation platform


computer controlled 20-inch telescope



above
Installation of the telescope

PRECEDENTS STUDIES - *building type*

Kihoku Astronomical Museum

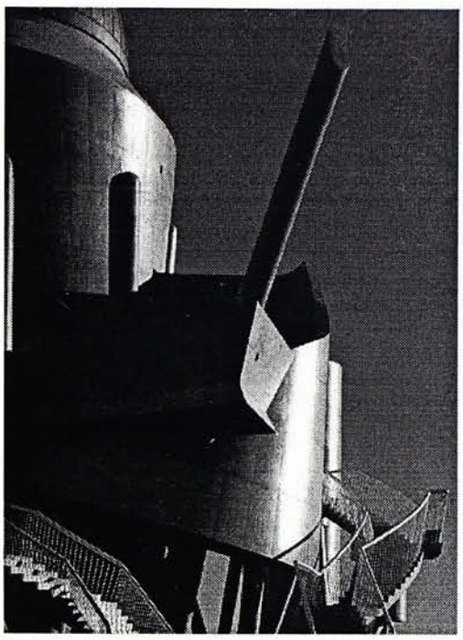
Masaharu Takasaki Architects

Kihoku, Kagoshima Prefecture

This observatory and community facility in the town of Kihoku has been designated the best site in Japan for continuous star gazing for the past four years.

The site is a scenic spot at 500m above sea level, within view of the volcanic Sakura Island in southwestern Japan. Architecture as a "social art" was the designer's first concern serving as the originality to draw people to it and to provide a core for the activities of the district. The building was also treated as a precast concrete sculpture standing in the landscape.

Because of the complex interweaving curve surfaces, with few regular perpendicular beams, columns and walls, countless adjustments of scaffolding, casts, concrete mixture and reinforcing in site were required.



above

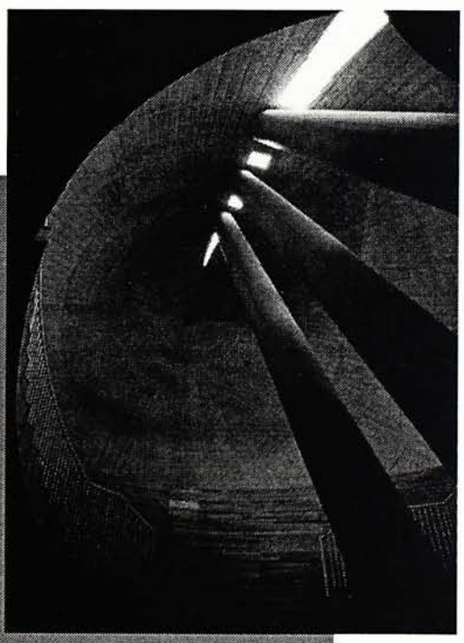
Partial view of the south facade

left

Earth Plaza on the 1st floor

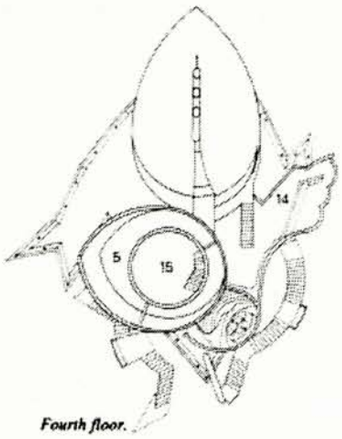
below

Upward view of the training room. The lotus-figured columns stretch upwards to the sky.

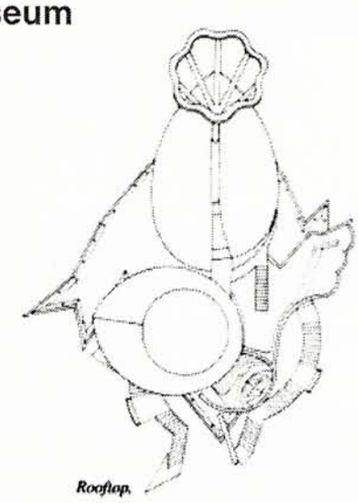


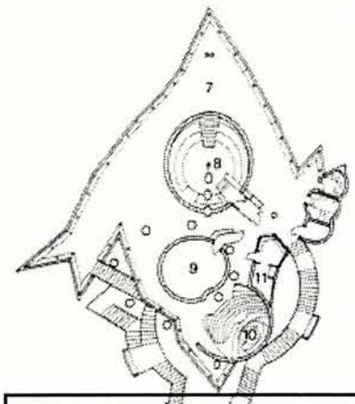
site area: *5,287m2*
site cover: *425m2*
total floor area: *427m2*
structure: *reinforced concrete; 4 stories*
completion date: *July, 1995*

Kihoku Astronomical Museum

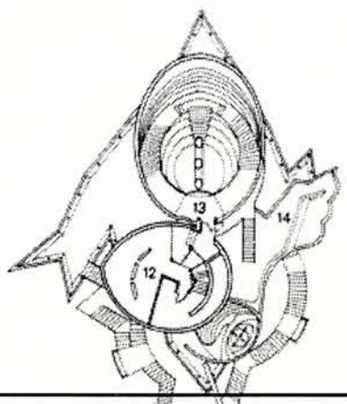


Fourth floor.


Rooftop.

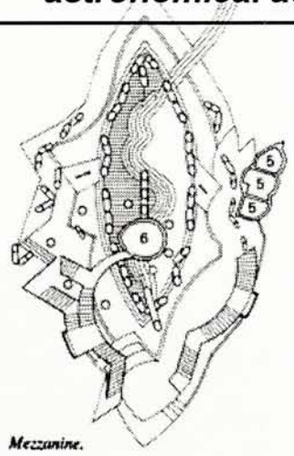


Second floor.

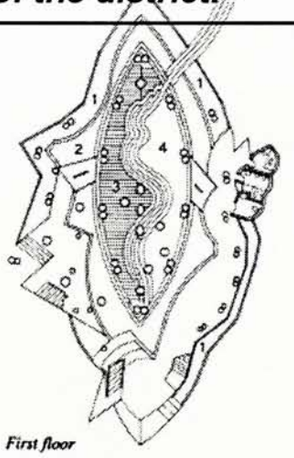


Third floor.

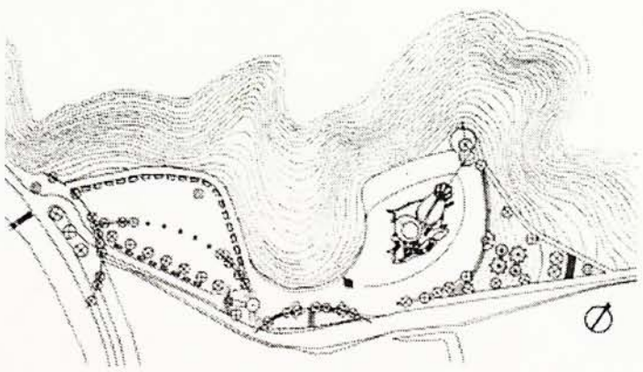
Mission: ***To create a social art architecture which draws people and provides a core for astronomical activities of the district.***

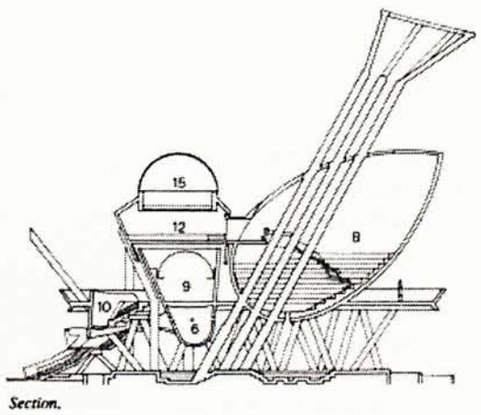


Mezzanine.



First floor





Section.

above

View toward the observation plaza from the south

key

1 *earth stage*
2 *water stage*
3 *earth plaza*
4 *water vein*
5 *void*
6 *children's house*
7 *observatory plaza*
8 *training room*
9 *star dome*
10 *star theater*
11 *office*
12 *exhibition room*
13 *aerial plaza*
14 *star plaza*
15 *astronomical observatory*

PRECEDENTS STUDIES - *site response*

The Rock House

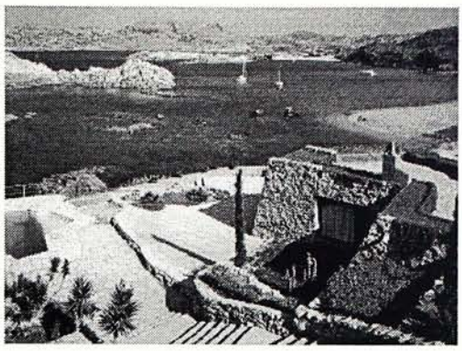
Javier Barba

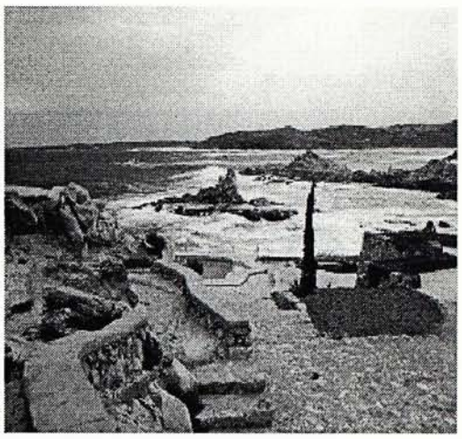
Menorca, Barcelona, Italy

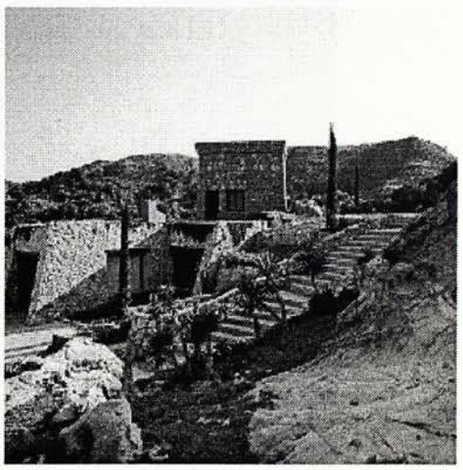
Locating on the northern coast of Menorca, the Rock House is surrounded with great natural beauty. With the concept of integrating the building into its rocky cliff site, architect, Javier Barba tried to make it as invisible as possible.

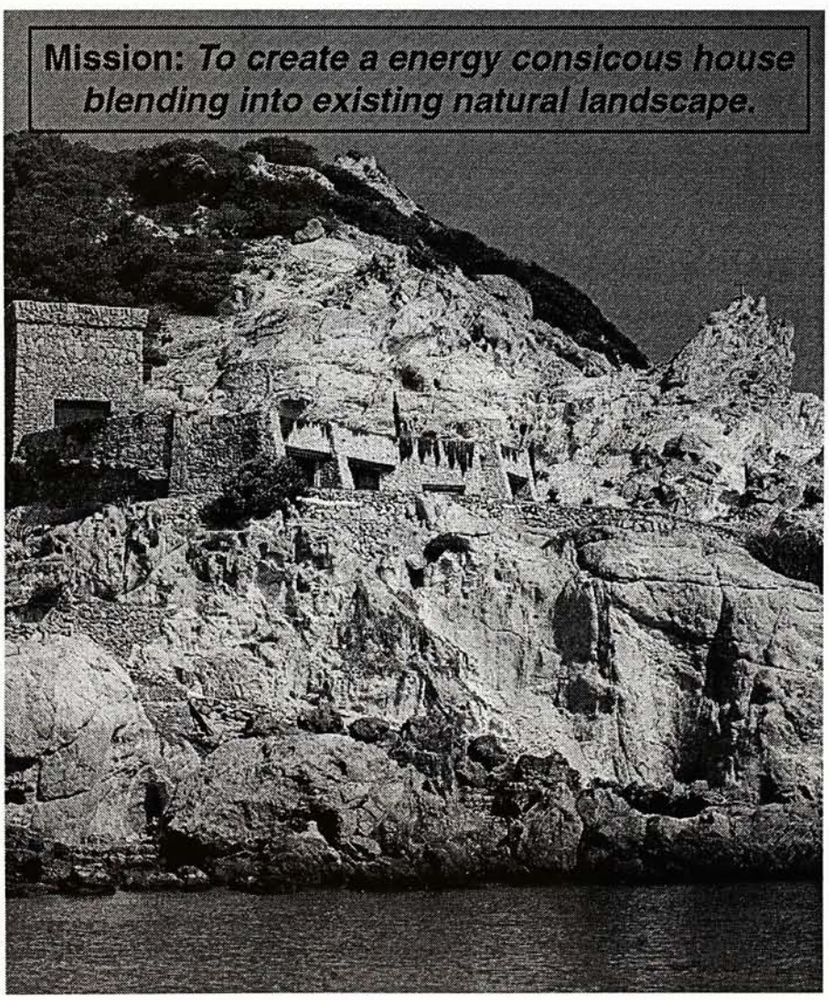
The House originally consisted of a derelict bungalow, garage and tower. An excavation was made to the surrounding rock to enlarge living space. The new living area was opened up with the roof serves as a terrace. The tower was also renovated to form a studio.

Sandstone from the excavation was used to construct the exterior walls. The thick rock walls help keeping the building cool during the summer. Vegetation was planted on the roof to merge into surrounding area.









Rough sandstone walls fit the house unobtrusively into the rocky cliff face. The planted roof terrace and stone steps also provide a natural colour scheme which almost completely concealed the house from above.

PRECEDENTS STUDIES - ***site response***

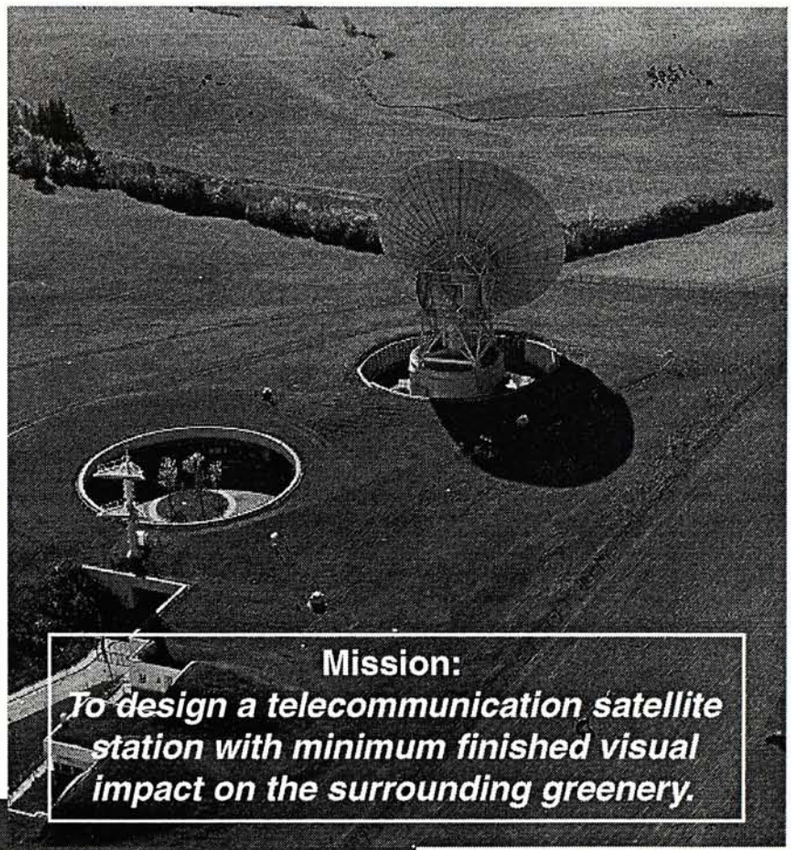
Telecommunication Satellite

Gustav Peichl

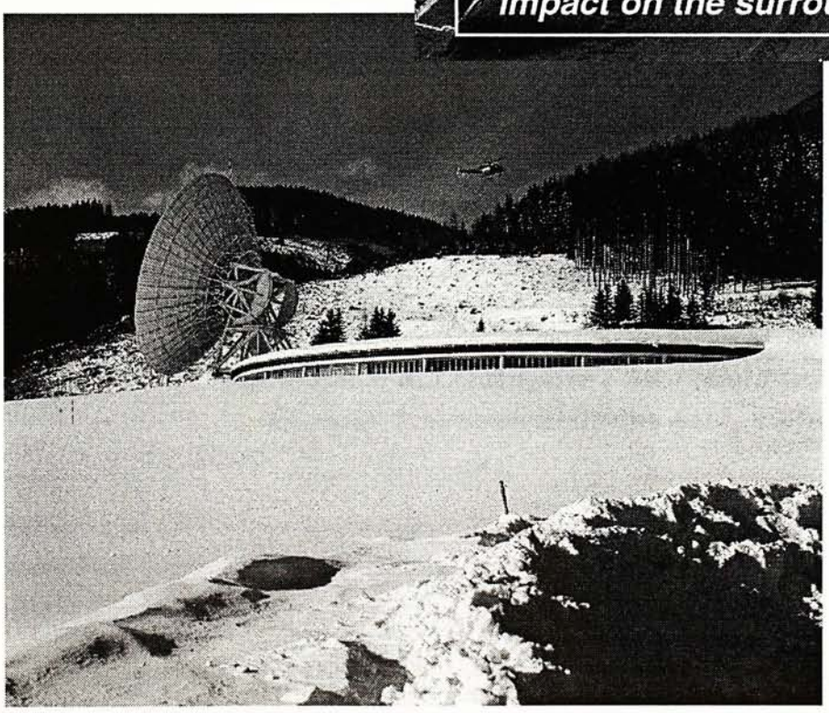
Aflenz, Austria

The development of this telecommunication satellite station in Aflenz, Austria includes a dominant satellite dish with other associate facilities. Architect, Gustav Peichl attempted the objective of minimum disturbance to the landscape by locating the offices and houses under the ground.

Circular courtyards are created with underground rooms on the periphery to receive natural sunlight. These circular designs also mirror the shape of the satellite dish.



Mission:
To design a telecommunication satellite station with minimum finished visual impact on the surrounding greenery.



Visual impact on the natural environment was minimized by building underground.

From down the hill, the development is well concealed to reduce disturbance to the natural surroundings.

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